DECEMBER 23, 1943

The

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IRON AGE

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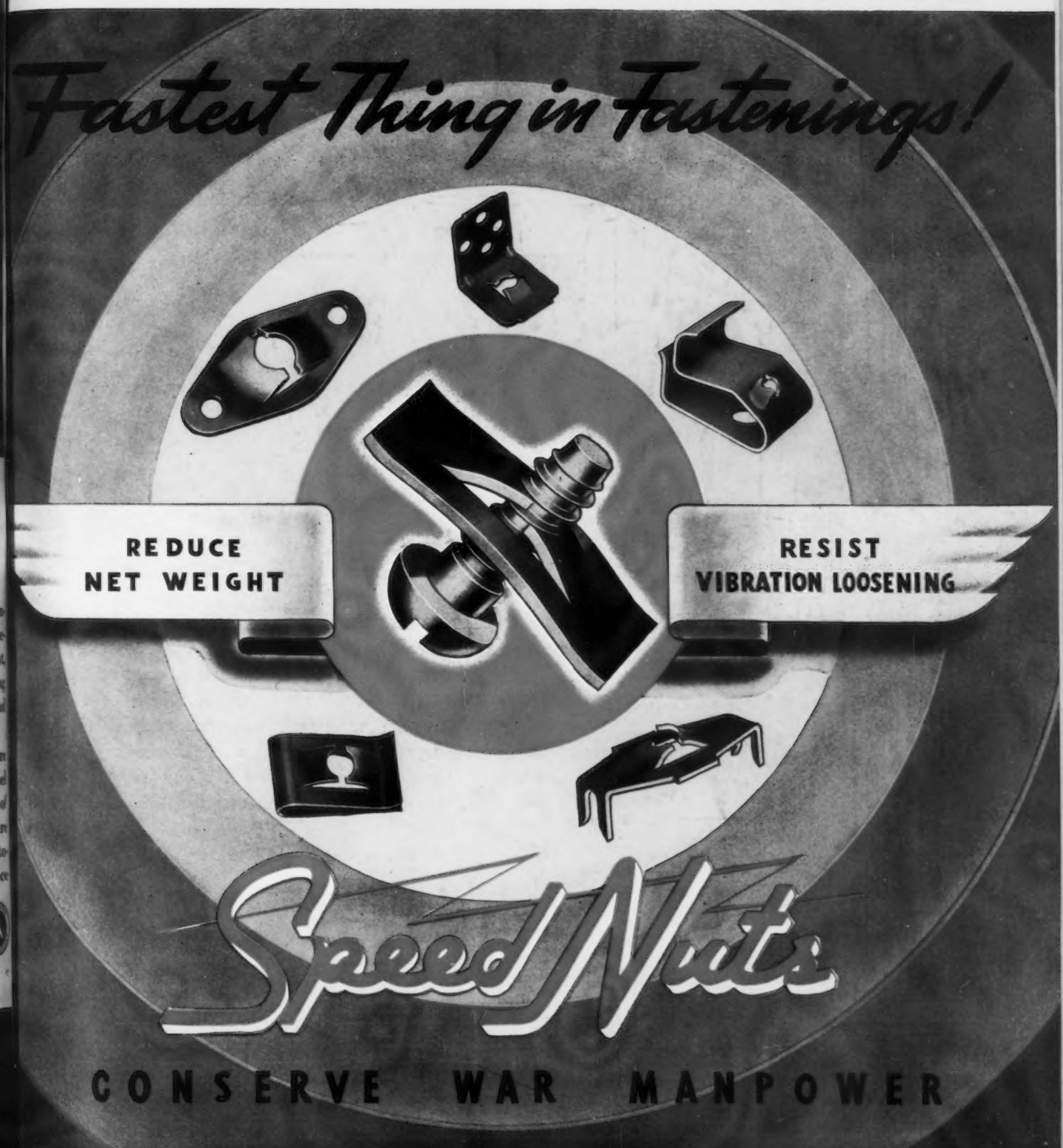

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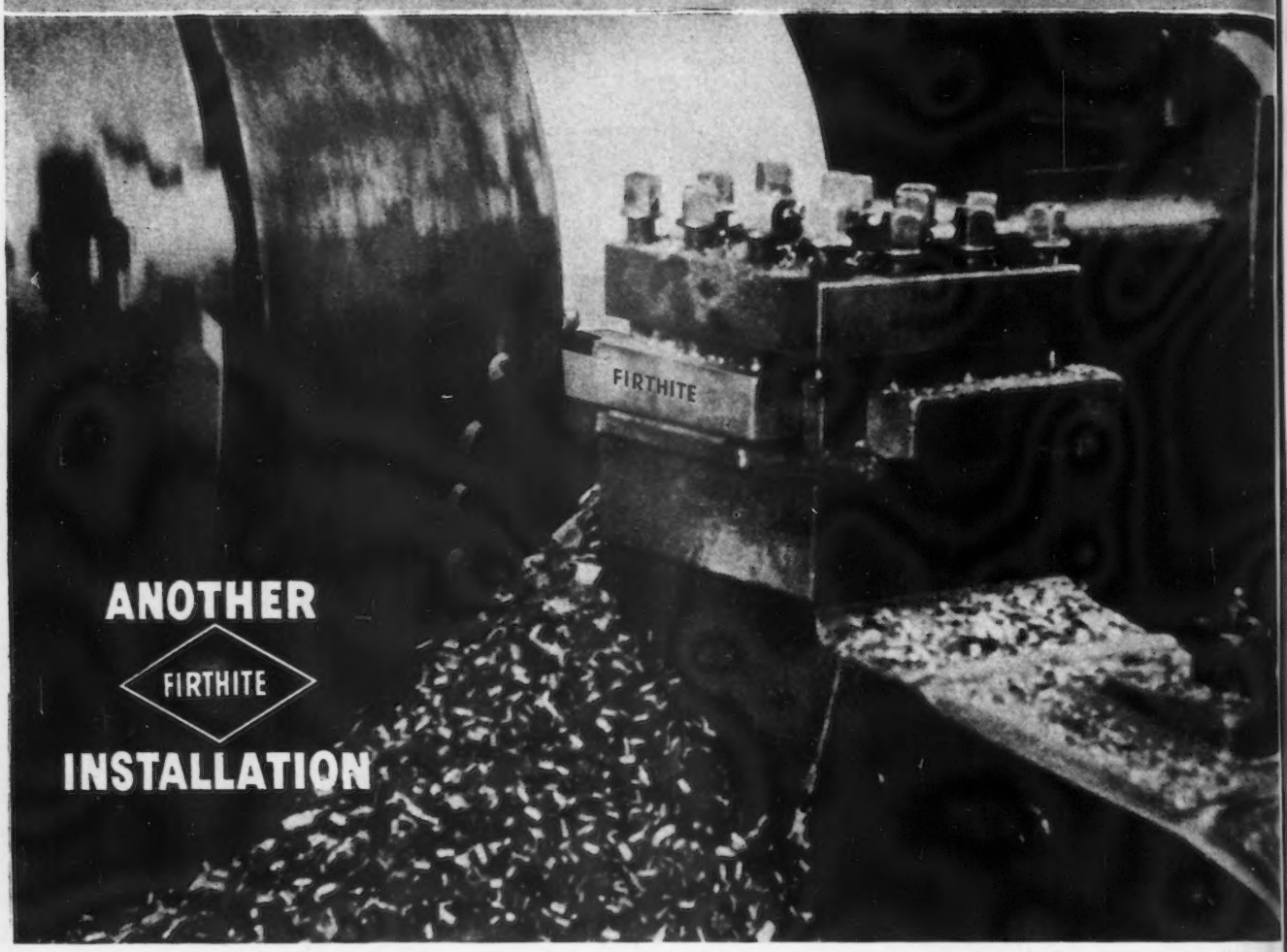

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Cooperation, Not Competition

UNFORTUNATELY the impression has been made that the responsibility of creating a satisfactory level of postwar employment rests upon the shoulders of the employers of America and their managements. This erroneous belief has been strengthened, I believe, by misinterpretation of the excellent work done by the Committee on Economic Development, otherwise known as the CED or the Hoffman Committee. The purpose of this committee has been, and is, to encourage and aid employers in every industrial community to undertake surveys of postwar products and their markets and to plan to keep employment in their communities on the highest possible level after the termination of war contracts.

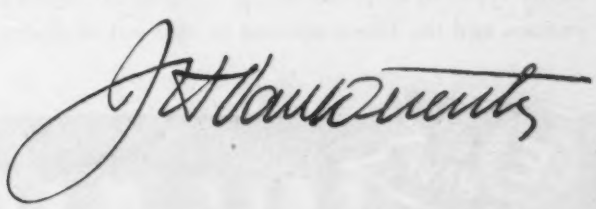
The results of such planning have been quite promising in industrial areas of long-standing and with a diversification of consumer products in so far as labor there presently employed is concerned. In the areas which predominate in the making of capital goods and in those communities which have mushroomed almost solely on war products, the outlook is not as good. There will of necessity be a large migration of labor away from shipbuilding, aircraft and munition areas after the war and this labor will seek jobs in other industries. If this displaced labor does not find such jobs in the possible postwar expansion of our established industries, it will look for it to Government. And Government, taking the easy way would then probably resurrect the departed but unmourned WPA, loved by none and hated even by its beneficiaries.

Government does have a tremendous responsibility with respect to helping to create postwar employment; as great a responsibility as has ownership and management. That responsibility is not to run industry but to make it as easy as possible for private ownership to keep it running at top speed.

The way for Government to do that is not to compete with industry but to cooperate with it. And the time to announce that policy of cooperation is now, for time is running out.

A beneficial postwar policy on the part of Government, for example, would make sure that our great industrial bellwether, the automobile industry, would not have its postwar employment capacity handicapped by the dumping of Government owned jeeps on the market after the war and that the machine tool and other capital equipment makers would not be hanging out "no help wanted" signs for the next ten years because of Uncle Sam going to market with several billions of dollars worth of machinery of all sorts at bargain prices.

These are Government responsibilities with respect to postwar employment. Another is to adopt such policies with respect to contract termination, renegotiation and corporate taxes that private industry will have enough money to reconvert without hocking itself to either the banking fraternity or the RFC.



How to Cut Replacement Costs

and Send More Steel to War

Regular inspections, adequate painting, and frequent lubrication, will cut replacement costs and save steel that is vitally needed in every quarter of the globe by America and her Allies.

Initiate, today, a special wartime inspection service. Examine roofs, siding, and structural members of buildings—especially where atmospheric conditions, or process fumes, result in destructive corrosion. Clean and paint steel that shows signs of deterioration. Consult a reliable paint manufacturer if standard paints do not prove satisfactory.

Many types of manufacturing equipment—trucks, cranes, and the like—operate in and out of doors. Such equipment should not only be painted, but moving parts should be adequately lubricated to save the steel that otherwise would be needed for replacement of parts.

The moving parts of all types of machinery should be regularly inspected to make certain that operators are applying lubricating oils and greases of the correct qualities, and in the right quantities. If undue wear of moving parts continues, ask a lubricant manufacturer for advice.

Take better care of the steel now serving you. Less steel used for replacement means more steel for the fighting fronts.

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The IRON AGE
DEC., 23, 1943

NEWS FRONT

• Curtailment of lend-lease shipments of ingots has forced the shutdown of two Kaiser open hearths at Fontana. Remaining furnaces supply sufficient ingots to keep the plate mill at present operating capacity.

• Geneva Steel Co. expects to blow in some time next month the first of its three blast furnaces. The pig iron will be stockpiled. Three of the nine open hearths and the rolling mills will be operated within the next four months.

• WPB-OPA plans for conversion to essential civilian production includes price revisions to equalize profits of low and high profit producers.

• Quality standardization will be left to industry.

• A temporary price increase of 55c. per 100 lb. on carbon steel plates to $3.20 f.o.b. Pacific Ports has been granted the Kaiser Co., Oakland, Cal., retroactive to Oct. 12.

• Despite huge postwar curtailment in aircraft production, Paul W. Litchfield, chairman of the Goodyear Aviation Corp., foresees the aircraft industry remaining a national industrial giant.

• Return to the six-day week in Pacific shipyards has increased labor productivity. Welding efficiency, for example, has doubled.

• The cast scrap famine on the West Coast has forced foundries to use a melt of 25 per cent steel scrap and 75 per cent pig iron.

• Spiking a union rumor of huge layoffs at the Douglas Aircraft Co., President Donald W. Douglas cited a backlog of three billion dollars. Douglas urged a Federal investigation of destructive rumors.

• Renegotiation after taxes on profits actually received or accrued is one of the drastic changes recommended by the Senate Finance Committee. A bitter conflict staged by Administration supporters will have to be overcome before such a measure is incorporated into the new law.

• Russian steel mills employ as high as 80 per cent women, as compared with 35 per cent in Britain and less than half that in the United States.

• Many Russian war plants are completely self-contained, with all electrical equipment, instruments, castings, machine work, etc., etc., for the final machine made in each plant. This is entirely different than practice in every other country, all of which sub-contract to a high degree.

• One of the world's largest producers of electric furnace carbon electrodes is the Aluminum Co. of America. All are used in Alcoa plants, none are sold.

• Detroit is probably right now at a peak of manpower requirements, rather than approaching a peak next March, as had been the expectation. Contract cancellations have been of such magnitude as to drastically change the whole manpower situation.

• The aircraft engine program has gone so far ahead of the airframe program, that cut-backs in engine production are making their appearance. Program alteration in engines may be of considerable magnitude in order to balance with other phases of the aircraft program.

• Over one-half of Detroit's manpower pool is working on ordnance orders. In the event of alteration in the European military situation, there would be almost an immediate release of large blocks of workers.

• Plans for a new steel mill at Mexico City are being worked up by a large American engineering concern. Contracts for materials will not be placed until financial details are smoothed out with the Export-Import bank.

• War material turned out in 1038 automotive plants totaled $8,840,000,000 in 1943. Price reductions, improved techniques and voluntary refunds by the industry have saved the government two billion dollars.

Dynamic Hardness Testing a

As a result of the interest aroused by the first paper on the subject[1], a more thorough search of the international literature has been made. Additional valuable data on dynamic hardness testing at elevated temperatures was found to be buried among other experimental results, partly scattered in rather inaccessible foreign periodicals. The materials tested, such as steels for high temperature service and especially in internal combustion engines, aluminum and its commercial wrought alloys, molybdenum vs. tungsten high speed steels, hard facings (Stellite) on austenitic valve steel for aeroplane motors, brass, bronze, etc., have been lately of particular metallurgical interest, seemingly making a review of such information a timely one. These dynamic indentation hardness tests are critically evaluated and condensed in graphical form.

Reference numbers correspond to bibliography appended to second section of this article in the Dec. 30 issue.

Additional experimental results of the author not presented in the first paper, are used in a polemical discussion of conclusions by other investigators and as a demonstration of the usefulness of the dynamic hardness tester for elevated temperature work. As the trend abroad has lately been to employ the simple and efficient dynamic hardness test at temperatures above atmospheric in conjunction with other physical testing methods, data from the latter are also reviewed briefly as far as they throw light on the nature and potentiality of the former. In laying these new dynamic hardness results before the American metallurgist and testing engineer, it is hoped that a comparison with domestic data obtained on similar material by other methods will aid in appraising the merits and possibilities of the dynamic indentation hardness test at elevated temperatures.

New developments in any technological field have always spread in a relatively short time to the major industrial countries all over the world. It would appear strange and inexplicable if the application of dynamic hardness testing of metallic materials should constitute an exception to this general rule as far as the American engineering fraternity is concerned. In surveying the international literature of nearly half a century, one finds an abundance of papers on dynamic indentation hardness testing in general, and, since 1920 many British, German, and Japanese publications on the application of this testing method in a study of metals and alloys at elevated temperatures. Yet the writer failed to locate any paper on the latter subject in the domestic literature and experiments along this line have in all probability not been released.

It stands to reason that the dynamic hardness test* would have been discarded abroad a long time ago had it not offered advantages. Instead, it is being used to an ever increasing extent. The author found it to be a simple and reliable tool for rapid testing at elevated temperatures of steels designed for high temperature service[1]. The objective in writing this paper is to arouse further interest in this country in the dynamic indentation hardness test by furnishing concrete proof of its achievements in the testing of metallic materials at temperatures above atmospheric.

** The same fundamental idea underlies both the static (Brinell, Rockwell, Vickers, etc.) and the dynamic hardness test. But instead of a slowly applied load, the dynamic hardness testing method uses a falling weight, a released spring or a blow by a pendulum or hammer to produce the indentation of the test piece. The terms of "pendulum" and "impact" hardness have been purposely avoided to prevent confusion respectively with the Herbert pendulum hardness tester and with notch-bar impact testing.*

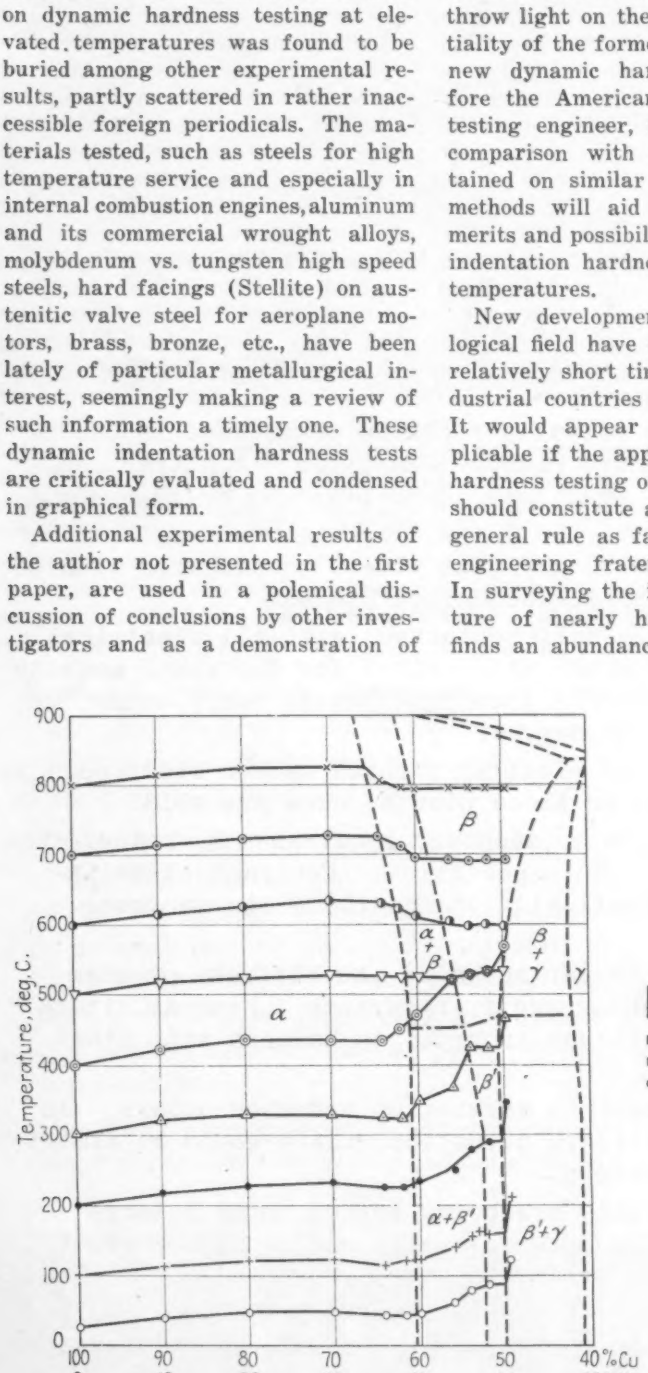

FIG. 1 — Changes of dynamic hardness of brass in relation to temperature and zinc content (Matsuda).

(A) Effect of Deformation Speed on Resistance to Plastic Deformation of Metals and Alloys: The wide interest abroad in dynamic hardness testing at elevated temperatures is due to two fundamental factors: (a) room temperature properties are no guarantee for the behavior at elevated temperatures and the dynamic hardness test represents a simple, efficient method for high temperature testing; (b) the hot working stresses in forging, cogging, rolling, riveting, extruding, drawing, pressing, etc., are many times faster than those applied in static tensile and hardness tests. Hence the determination of resistance to plastic deformation by dynamic forces is most likely to furnish

at Elevated Temperatures

. . . Supplementing previously reported dynamic hardness testing results obtained at elevated temperatures, more recent data on alloy steels for high temperature service, tungsten and molybdenum high-speed steels, Stellite and substitution alloys, carbon tool steel, nickel-chromium alloys, special brands of 18/8, precipitation-hardening copper-bearing steel, aluminum and aluminum wrought alloys, copper, brass, bronze and copper-aluminum are graphically presented herein and critically discussed. The effects of four various hardening temperatures, two quenching media and two temper hardnesses on the softening of a tungsten-chromium-vanadium and a chromium-tungsten-silicon die steel are investigated by dynamic hardness tests at elevated temperatures and by static (Brinell) hardness tests at room temperature. The latest two German models of dynamic indentation hardness machines for medium and high temperature work are described, and the present state of dynamic hardness testing is critically reviewed.

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By ERICH FETZ

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data comparable to the operations mentioned above.

The differences between static and dynamic hardness/temperature curves prove that the static method does not necessarily tell the correct resistance to plastic forming at fast deformation speeds. In extreme cases, a maximum of dynamic hardness coincides with a minimum of static hardness[2,3,4]. By gradually increasing the deformation speed in impact torsion and high-speed tension tests, the maximum of yield strength and of ultimate strength of iron and steel are progressively shifted to higher temperatures[5,6].

The object of this paper is not to discredit, or replace the static hardness test at elevated temperatures, but to supplement it. Static testing has been expanded in the direction of extremely slow speeds. Recently efforts have even been made to substitute the cumbersome, time-absorbing creep test with flow/time tests in static hardness machines[7]. A systematic survey in the opposite direction of extremely rapid strain rates appears a logical development as it imitates more correctly a number of service conditions and in view of the great importance of the hot working and shaping of metals and alloys in comparison with the cold working processes.

Dynamic hardness testing also deserves a place in scientific studies. When establishing constitutional diagrams, the previously used static method does not clearly indicate a change of properties owing to a constitutional change, especially if the latter is above the "recrystallization"* temperature[8,9,32,33]. The static method establishes what Edwards and Herbert[8] call the "recuperative powers" but not the "intrinsic plasticity." Edwards and Herbert refer to the marked differences between the hot hardnesses established by static and dynamic means on copper-aluminum and brass. Fig. 1 superimposes changes of dynamic hardness on the binary copper-zinc diagram[9]. In the alpha + beta range, the hardness increases rapidly with increasing zinc contents at lower temperatures due to an increase of beta. Above 600 deg. C. (1110 deg. F.) the zinc-rich alloys become softer than those lower in zinc. At high temperatures, the dynamic hardness of beta is almost independent of composition. This agrees well with the established fact that brasses containing beta are easily subject to hot working. Static tests do not yield as clear a demarcation of the phase boundaries as dynamic. The most abrupt changes in mechanical properties occur at temperatures substantially below those at which constitutional changes take place[10]. The release of work hardening ("recrystallization") profoundly affects the static strength (hardness)/temperature relation. But this factor is practically absent in dynamic tests.

Two phenomena occurring at fast deformation speeds should not be overlooked: (a) the considerable work hardening effects at temperatures above the recrystallization temperature range, and (b) the slowness in the release of these working stresses.

Even at temperatures close to the melting point, surprisingly high resistances to plastic deformation at fast strain rates have been discovered by dynamic hardness, upsettting, and high-speed tensile tests[6,11].

Copper, aluminum, iron, high-carbon steel, 4 per cent silicon steel, 25 per cent nickel steel, etc., upset by a single blow impact and then quenched or air-cooled through the recrystallization temperature range were not, or only partly relieved of work hardening because these materials had not sufficient time to "recrystallize" as they would in static tests in or above the recrystallization temperature range.

"Room temperature" represents an arbitrary, though practical reference point. Some metals and alloys recover from the effect of cold working at atmospheric temperature. The deformation speed therefore, affects their room temperature hardness. Tin, for instance, is softer than aluminum in Brinell testing, but harder in dynamic testing[12]. The term "elevated temperature" is consequently scientifically incorrect. The ideal solution of placing all hardness and tensile tests on a rational basis would be a three-dimensional diagram with the variables of deformation speed, absolute temperature, and strength (hardness).

(B) Dynamic Hardness vs. other

** The term "recrystallization" is used in the broadest sense which disregards that the release of work hardening may take place at temperatures different from the microscopic recrystallization of the deformation texture.*

TABLE I

Chemical Analysis of High-Temperature Steels and Nickel-Chromium Tested by Körber and Pomp. (Figs. 2 and 3)

Steel	Per Cent C	Si	Mn	Cr	Ni	P	S	W	Mo	Fe	
1	0.43	3.23	0.33	8.43	0.08	0.021	0.002	n.d	n.d	n.d	
2	0.40	4.23	0.33	3.42	0.09	0.022	0.004	n.d	n.d	n.d	1.76 Co
3	0.47	1.49	0.80	14.78	12.94	0.016	0.004	2.16	n.d	n.d	
4	0.46	0.52	1.31	12.71	12.86	0.025	0.006	9.65	n.d	n.d	
5	0.95	1.63	0.74	15.14	12.80	0.011	0.039	2.45	0.08	n.d	
6	1.31	0.44	0.42	13.98	n.d	0.022	0.007	n.d	n.d	n.d	1.96 Co
7	0.94	0.50	0.18	16.62	0.18	0.010	0.030	n.d	0.59	n.d	2.28 Co, 0.35 V
8	0.11	0.56	0.62	17.72	8.48	0.011	0.025	1.03	0.20	n.d	0.23 Cu, 0.22 Ti
9	0.67	2.05	5.16	15.89	0.35	0.022	0.012	5.27	n.d	n.d	
10	n.d	n.d	1.78	15.10	60.30	n.d	n.d	n.d	7.18	15.40	

n.d. = not determined

Physical Properties of High-Temperature Steels and of 60/15 Nickel-Chromium at 600 to 900 Deg. C. (1110 to 1650 Deg. F.) Körber and Pomp[13] included dynamic hardness determinations at elevated temperatures in testing nine alloy steels and 60/15 nickel-chromium for chemical analysis (Table I), microstructure, magnetism, tensile strength at room temperature and at 600 deg. C. (1110 deg. F.) (Table II), tensile strength in slow-speed tests of 20 min. duration at 600 to 900 deg. C. (1110 to 1650 deg. F.) (Fig. 2), dynamic hardness in the same temperature range (Fig. 3) and creep at 700 deg. C. (1290 deg. F.) (Table II).

Steels 1 to 9 are obviously intended for high temperature use. As to alloy 10, American brands of "60/15" contain no molybdenum, run high in silicon and are mainly designed for resistor material in electrical heating. The German modification 10 containing 7 per cent molybdenum, is used as a high-temperature construction material. Incidentally, the latter alloy and the chromium-nickel-tungsten steel 3 are included in an exhaustive study of 24 of the latest German high-alloy steels used in gas turbines and explosion motors[14]. These two papers released by the German Research Institute for Aeronautics present further data on specific weight, thermal expansion, microstructural stability, and on the resistance to scaling, creep, temperature cycles and corrosion by plain and anti-knock fuel.

It would have been gratifying if Professors Körber and Pomp, foremost German metallurgists, had interpreted the results of their investigation sponsored by the German Institute for Aeronautical Research. Unfortunately, the authors confined themselves to a mere reporting of their results. The primary concern here deals with the relationship of dynamic hardness to other physical properties, and an attempt has been made in Table III to evaluate the experimental data by setting up "orders of merit" with the strongest (hardest) steel heading the order and the softest at the bottom. Steels shifted by more than two places in their relative order of strength (hardness) are marked by brackets.

Dynamic hardness and tensile strength do not run parallel at 600 deg. C. (1110 deg. F.) (horizontal line A vs. B and C). The high-alloy nickel-chromium steels 3 and 5 and the 16 per cent chromium steels 7 and 9 containing additions of cobalt, molybdenum, vanadium, and tungsten, manganese, or silicon respectively, follow consecutively, while the low-alloy steels 2 and 1 and the high-carbon 14 per cent chromium steel 6 appear to be materially "stronger" in the dynamic tests than in the tensile. These discrepancies may partly be explained on the following basis. Plain carbon and low-alloy steels[3,5,4,15,16] and 12 per cent chromium steel[1] reach a peak value of dynamic hardness between 400 and 600 deg. C. (750 and 1110 deg. F.). In static tests,

TABLE II

Physical Properties of Nine Steels and of 60/15 Nickel-Chromium (Körber and Pomp)

Steel No.	Physical Properties at Room Temperature: Ultimate Strength, Lb. Per Sq. In.	Yield Point, Lb. Per Sq. In.	Elongation, Per Cent	Reduction of Area, Per Cent	Physical Properties at 600 Deg. C.* (1110 Deg. F.): Ultimate Strength, Lb. Per Sq. In.	Yield Point, Lb. Per Sq. In.	Elongation, Per Cent	Reduction of Area, Per Cent	Magnetic Test	Creep at 700 Deg. C., (1290 deg. F.) after 250 Hr. Load = 1 Kg. Per Sq. Mm.
1	139,300	107,200	15.4	47	50,200	27,200	45.3	90	Ferro-magnetic	
2	153,000	131,000	11.8	10	48,800	27,080	58.5	96	Ferro-magnetic	
3	109,000	52,600	32.0	44	72,700	34,000	30.7	50	Non-magnetic	
4	117,200	63,600	24.8	42	84,600	47,100	20.5	36	Non-magnetic	
5	128,000	53,600	21.3	22	79,800	36,300	22.0	23	Slightly Ferro-magnetic	45×10^{-3} Per Cent
6	128,200	78,500	8.1	10	64,600	37,600	21.8	38	Slightly Ferro-magnetic	
7	118,000	78,500	14.0	25	45,500	20,000	31.5	62	Ferro-magnetic	43×10^{-3} Per Cent
8	95,600	42,200	45.2	72	55,500	25,600	30.0	69	Slightly Ferro-magnetic	4×10^{-3} Per Cent
9	127,000	72,600	6.5	4	88,000	39,000	26.1	29	Non-magnetic	
10	110,000	49,400	39.9	65	84,200	22,000	43.0	56	Non-magnetic	87×10^{-3} Per Cent

* Tensile test bar broken in 3 min. after reaching the yield point.

this peak value is either absent or occurs at lower temperatures and can be shifted by increasing deformation speeds[5,6].

At 600 deg. C. (1110 deg F.), the low-alloy chromium - silicon - cobalt steel 2 is the second hardest steel in the dynamic hardness tests, but ranks next to the softest in the slow-speed tensile tests. Increasing the pulling speed causes only minor changes in the relative position of the ten materials studied. (B vs. C.)

There is a much closer interrelation at 600 deg. C. between dynamic hardness and yield strength (A vs. D). than between dynamic hardness and ultimate strength (A vs. B or C). Only two steels appear in an unexpected position in the former series, while six out of ten steels are "displaced" when comparing dynamic hardness and ultimate strength. This important deduction deserves further investigation as it promises to throw more light on the nature and value of the dynamic hardness.

In contradistinction to the tests at 600 deg. C. (1110 deg. F.), a surprisingly close agreement exists between dynamic hardness and tensile strength at 900 deg. C. (1650 deg. F.) (E vs. F). The disturbance caused by the directional change of the dynamic hardness curves of some steels is absent. Only the modified 18/8 appears to be somewhat stronger in the tensile than in the dynamic hardness tests.

The poor showing of "60/15" in comparison with the modified 18/8 in the creep tests (Table II) is confirmed by Bollenrath and co-workers[14]. Find-

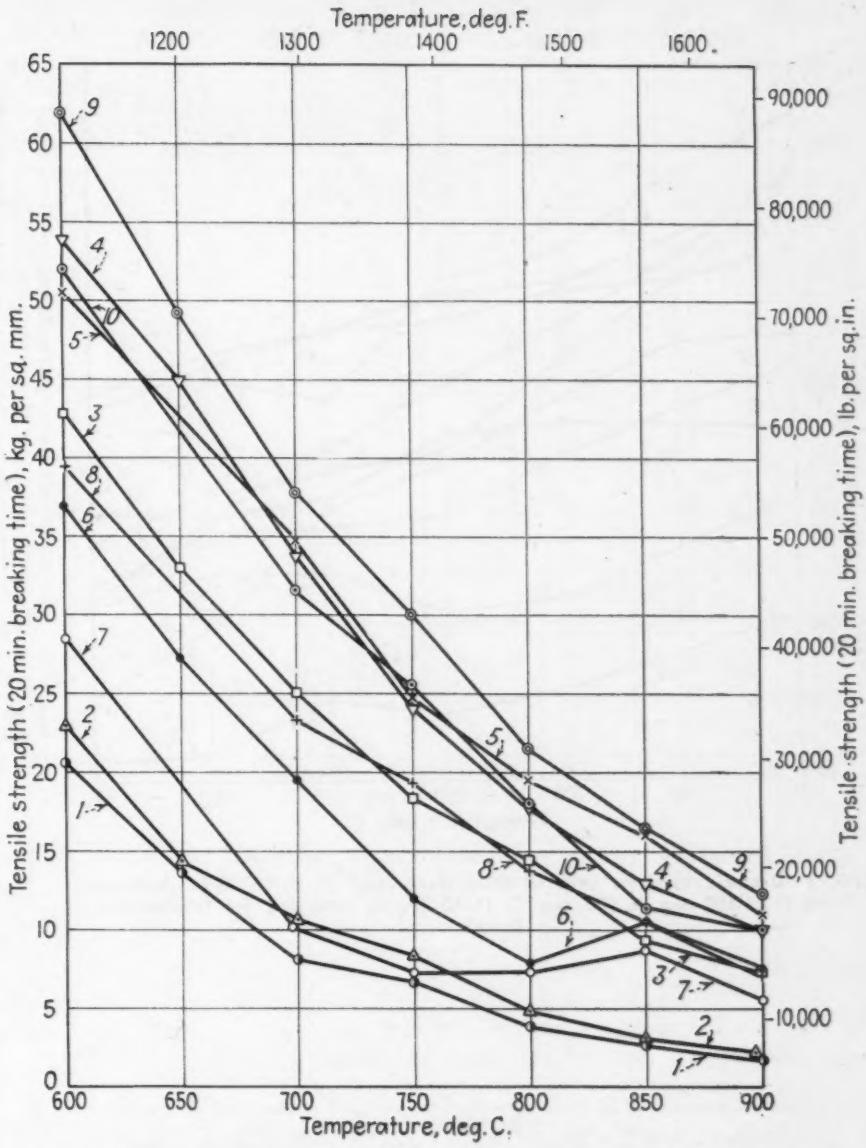

FIG. 2—Tensile strength of nine alloy steels and of 60/15 nickel-chromium (Table I) at 600 deg. to 900 deg. C. (1110 deg. to 1650 deg. F.) (Körber and Pomp).

TABLE III

Relative Order of Strength (Hardness) at 600 and 900 Deg. C. of Steels 1 to 9 and of 60/15 Nickel-Chromium. (Analyses in Table I)

Testing Temperature	Order of Merit*	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	
600 Deg. C. (1100 Deg. F.)	Dynamic hardness tests (Fig. 3)	(6)	(2)	9	5	(4)	(1)	3	(10)	7	(8)	A
	Tensile strength, slow speed tests (Fig. 1)	9	(4)	(10)	5	3	(8)	(6)	7	(2)	(1)	B
	Tensile strength, normal speed tests (Table II)	9	(4)	(10)	5	3	(6)	(8)	1	(2)	7	C
	Yield point, normal speed tests (Table II)	(4)	9	6	5	3	1	(2)	8	10	7	D
900 Deg. C. (1650 Deg. F.)	Dynamic hardness tests (Fig. 3)	5	9	6	10	4	3	2	7	1	(8)	E
	Tensile strength, slow speed tests (Fig. 2)	9	5	10	4	6	3	(8)	7	2	1	F

* Strongest (hardest) steel in first place, softest in tenth.

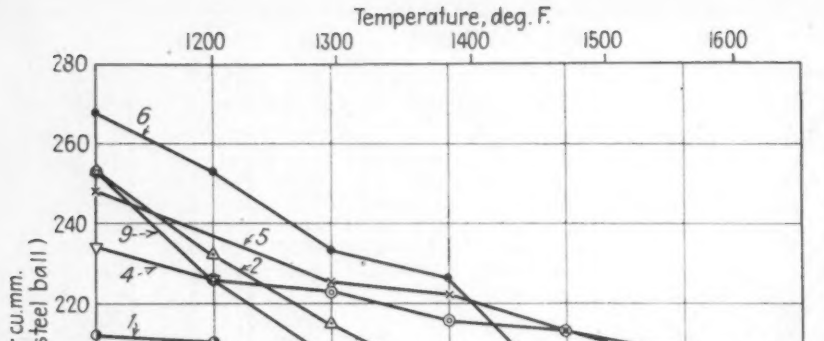

FIG. 3—Dynamic hardness of nine alloy steels and of 60/15 nickel-chromium (Table I) at 600 deg. to 900 deg. C. (1110 deg. to 1650 deg. F.) (Körber and Pomp).

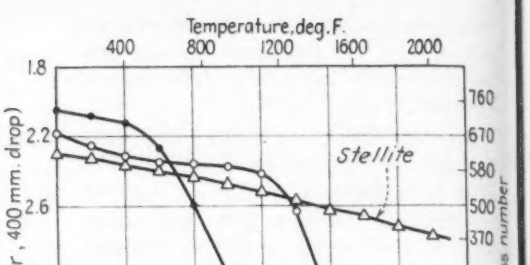

FIG. 5—Dynamic hardness of hardened carbon tool steel, heat treated high-speed steel and Stellite at elevated temperatures (Oertel and Pölzguter).

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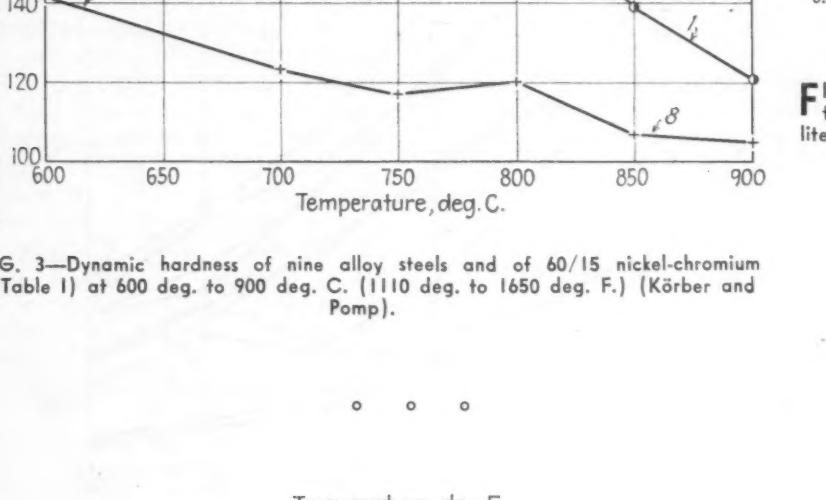

FIG. 4—Dynamic hardness at elevated temperatures of four different brands of 18/8 (Körber and Pomp, Cornelius and Trossen, and author).

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ings by Both and Rohn, who tested plain 18/8, disagree[17].

The addition of tungsten, molybdenum, copper, and titanium increases the absolute dynamic hardness of 18/8 at elevated temperatures, but it does not materially affect the softening rate. (Fig. 4.) According to the author's tests[1], low-carbon 18/8 loses about 28 per cent of its dynamic hardness between 600 and 900 deg. C. and, according to Körber and Pomp, about 25 per cent when adding the above mentioned elements to 18/8. An 18/8 with 0.8 per cent tungsten and 1.3 per cent tantalum and columbium loses 26 per cent of its dynamic hardness between 600 and 900 deg C. according to Cornelius and Trossen[23]. Increasing the carbon content from 0.07 to 0.20 per cent radically changes the course of the dynamic hardness/temperature curve due to carbide precipitation.

(C) Dynamic Hardness vs. Tool Life of Tungsten and Molybdenum

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High Speed Steels: Many experimenters have tried in the past to replace the cumbersome, time-absorbing lathe testing of high-speed steel by a simple, short-time test. Oertel and Pölzguter[19] have confirmed by dynamic hardness measurements the previously found[2,19] marked differences between the softening of hardened plain carbon tool steel, high-speed steel and Stellite (Fig. 5). In view of correspondingly great differences in their cutting performances, the possibility of replacing the customary tool life test by dynamic hardness and static tensile tests at elevated temperatures has been investigated.

Fig. 7 shows the dynamic hardness of three tungsten high-speed steels *a*, *b*, *c*, of a molybdenum steel *d* and of a molybdenum - cobalt - vanadium high-speed steel *e* (Table IV) up to 1110 deg. C. (2010 deg. F.) The ball indentations are used as a measure of hardness. From a conversion curve obtained by testing materials of different hardness both statically and dynamically, the dynamic hardnesses are also converted into Brinell values. The insert in Fig. 6 gives the tool life of these five steels when cutting a steel of 107,000 lb. per sq. in. at 5.58 ft. per min. with a 5/32-in. depth of cut and 0.055-in. feed.

The three tungsten high-speed steels show the same order of merit in both the dynamic hardness and cutting tests, the performances being the more advantageous the higher the tungsten content. The 6 per cent molybdenum high-speed steel *d* begins to soften at a much lower temperature than the tungsten high-speed steels and it also has the poorest tool life. Steel *e*, which runs higher in molybdenum and carbon than steel *d* and which also contains a substantial addition of cobalt and vanadium, yielded the second best tool life. Strangely, it fared poorest in the dynamic hardness tests. As no details on the thermal pretreatment are given, it is difficult to deduce why this one steel does not fall in line in one test. It shall be shown in Section D how the previous history of two tungsten die steels may profoundly affect the softening at elevated temperatures. A reinvestigation of the problem of dynamic hardness vs. tool life would be in place. Incidentally, Kayser[20] claims to have discovered a relationship between these two properties without presenting the experimental evidence.

Oertel and Pölzguter studied the dynamic hot hardness of the tungsten high-speed steels *b* and *c* first in the oil-quenched condition, and second, after an additional tempering at 580

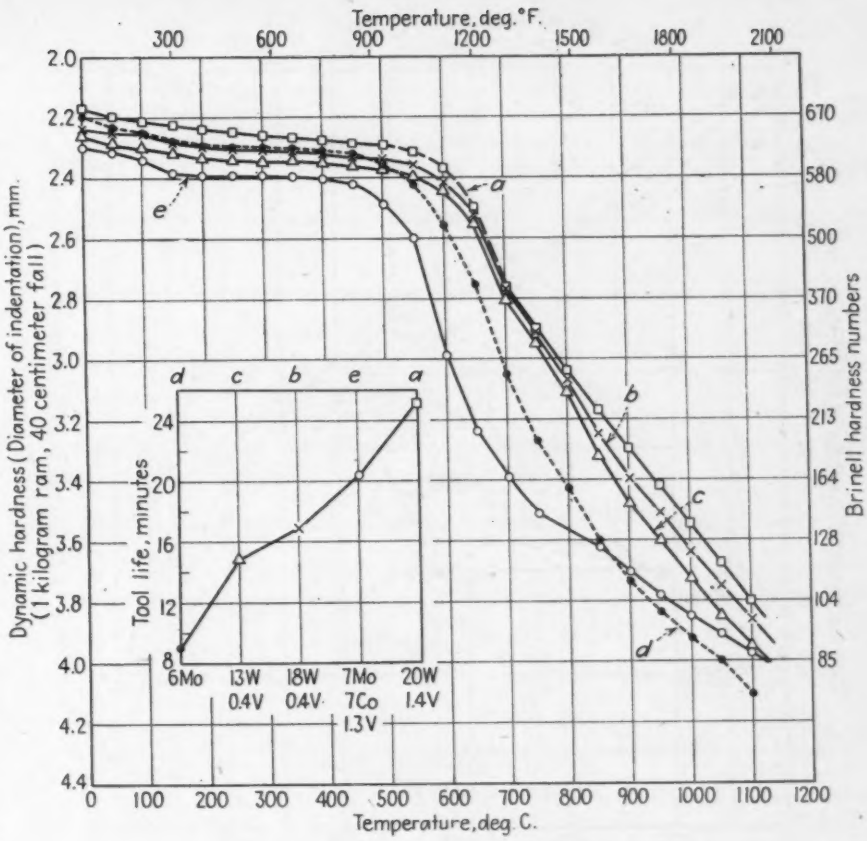

FIG. 6—Tool life (insert) and dynamic hardness at elevated temperatures of five high speed steels (Table IV) (Oertel and Pölzguter).

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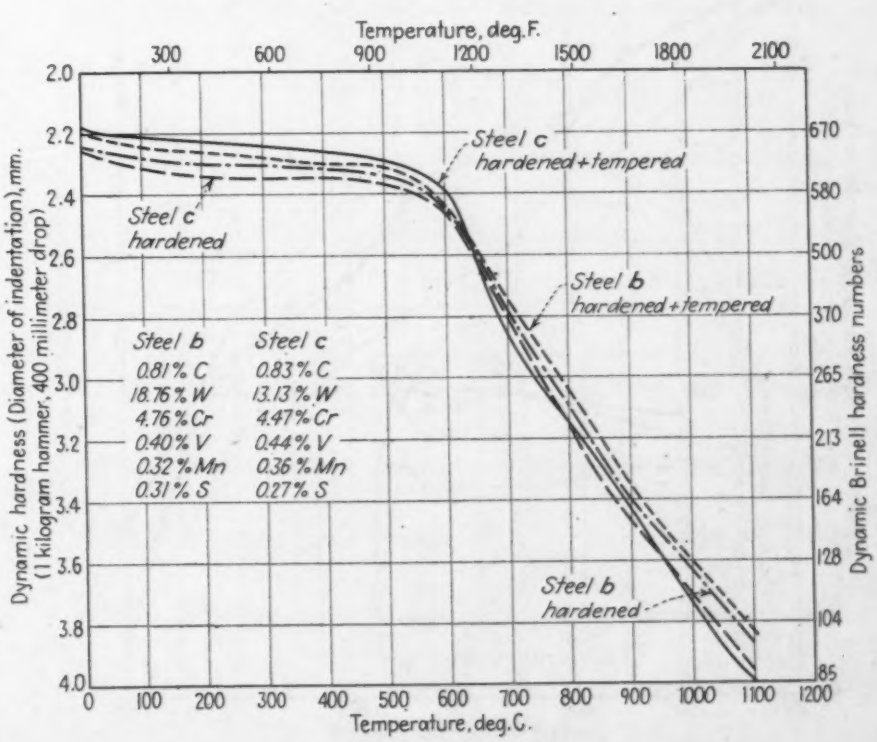
FIG. 7—Dynamic hardness of two tungsten high-speed steels in relation to temperature and thermal pretreatment (Oertel and Pölzguter).



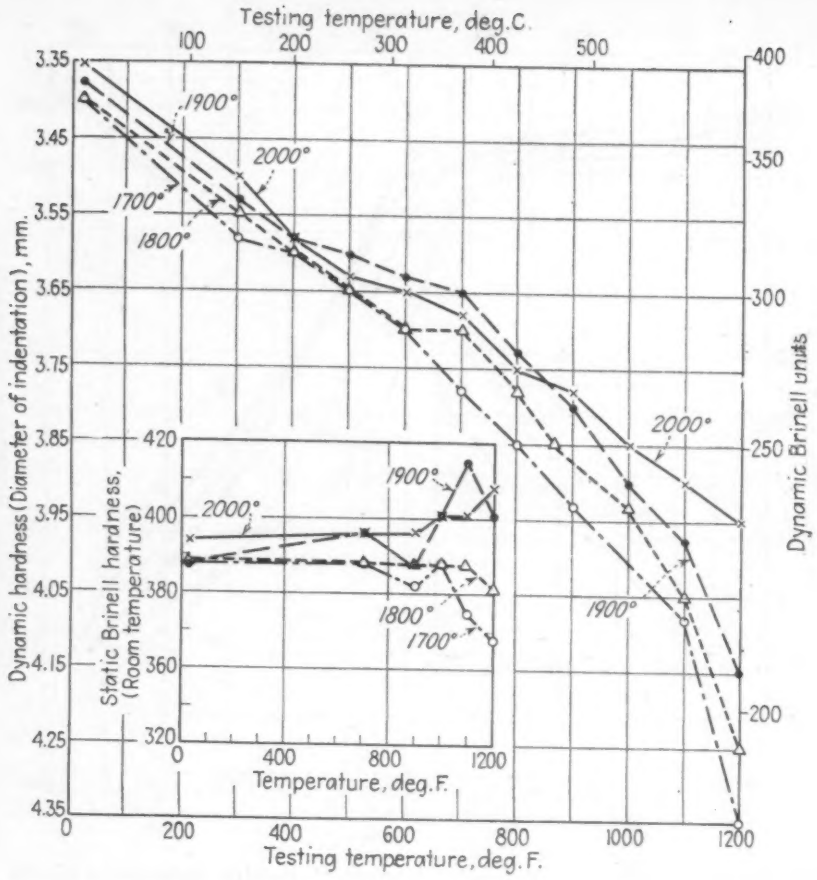


FIG. 8—Effect of quenching temperature on the dynamic hardness at elevated temperatures of an oil-quenched tungsten - chromium - vanadium die steel drawn to 388 Brinell. Insert: Room temperature Brinell hardness after testing for dynamic hardness at elevated temperature (Author).

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deg. C. (1075 deg. F.) which increases the tool life (Fig. 7). The drawn samples maintain their higher initial hardness to about 600 deg. C. (1110 deg. F.), but there is no difference as to the drastic softening around 650 deg. C. (1200 deg. F.) This finding is at variance with results by Page[21] on a 14 per cent tungsten high speed steel, and by the author of this paper on a 15 and 11 per cent tungsten die steel.

Oertel and Pölzguter purposely hardened some high-speed steels at the wrong temperatures of 950 to 1000 deg. C. (1740 to 1830 deg. F.), which resulted in a very poor tool life and also in a pronounced drop of dynamic hardness at 450 to 500 deg. C. (840 to 930 deg. F.).

The tensile strengths varied up to 100 per cent below 400 deg. C. (750 deg. F.) due to variations in the pulling speed. At higher temperatures, the values became reproducible but no relation to tool life could be detected.

Oertel and Pölzguter conclude that interrelations do exist between cutting efficiency, dynamic hardness at elevated temperatures, and composition. However, the differences in dynamic hardness are not considered to be unequivocal and sufficiently pronounced to permit quantitative predictions on the service of high-speed steel.

(D) Effect of Thermal Pretreatment on Dynamic Hardness of Die Steels up to 1200 deg. F. (650 Deg. C.). It is obvious that hardness and strength at elevated temperatures are fundamentally related to the perform-

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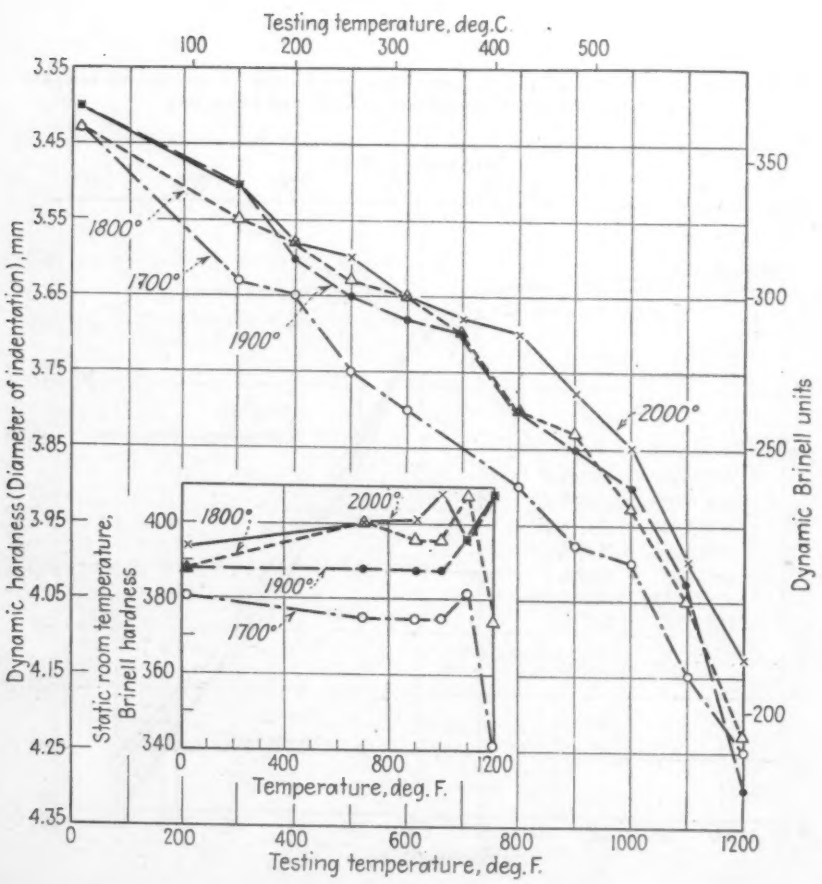
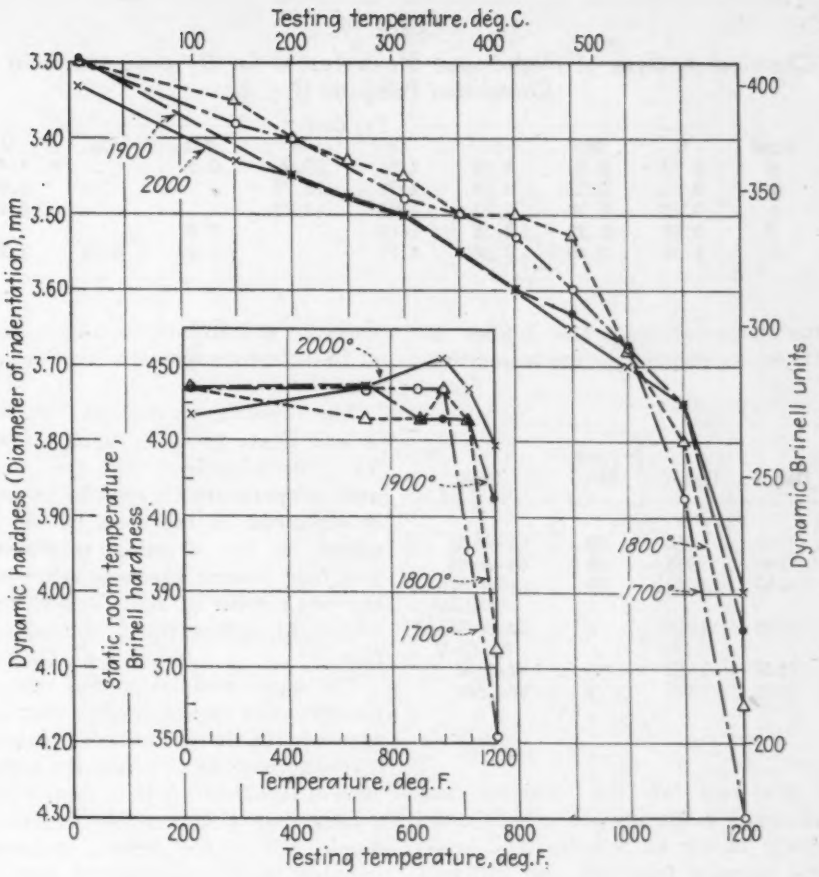


FIG. 9—Effect of quenching temperature on the dynamic hardness at elevated temperatures of an air-cooled tungsten - chromium - vanadium die steel drawn to 388 Brinell. Insert: Room temperature Brinell hardness after dynamic test at elevated temperature (Author).

FIG. 10—Effect of quenching temperature on the dynamic hardness at elevated temperatures of an oil-quenched tungsten - chromium - vanadium die steel drawn to 444 Brinell. Insert: Room temperature Brinell hardness after dynamic test at elevated temperature (Author).



ance of high speed and die steels. The questions arise: How far can the loss of room temperature hardness be affected by heat treatment, and temperatures of drastic softening be raised by thermal pretreatment?

Oertel and Pölzguter[18] feel that the softening rate of high speed steel drawn to different hardnesses remains about constant, but that the samples drawn to a higher hardness stand up better until a temperature of marked softening has been reached. The thermal pretreatment is considered not to affect this softening point. The data presented do not permit such sweeping conclusions which are also theoretically open to doubt. The rate of softening of a 14 per cent tungsten high speed steel has been shown to be affected by different heat treatments and its softening point has been shifted by as much as 100 deg. C.[21]

The following dynamic hardness tests of the author study the effect of two temper hardnesses, four hardening temperatures and two quenching media on the softening of two die steels at elevated temperatures. The previously described guillotine type of dynamic hardness tester was used.[1] The tungsten - chromium - vanadium steel A and the chromium-tungsten-silicon steel B analyzed: Steel A, 0.46 C, 0.25 Mn, 0.19 Si, 2.05 Cr, 0.20 V, 11.48 W. Steel B, 0.35 C, 0.26 Mn, 1.22 Si, 5.26 Cr, 4.58 W. These were preheated in a muffle furnace to 1500 deg. F. (815 deg. C.) and then quickly brought up to four different harden-

FIG. 11—Effect of quenching temperature on the dynamic hardness at elevated temperatures of an air-cooled tungsten - chromium - vanadium die steel drawn to 444 Brinell. Insert: Room temperature Brinell hardness after dynamic test at elevated temperature (Author).

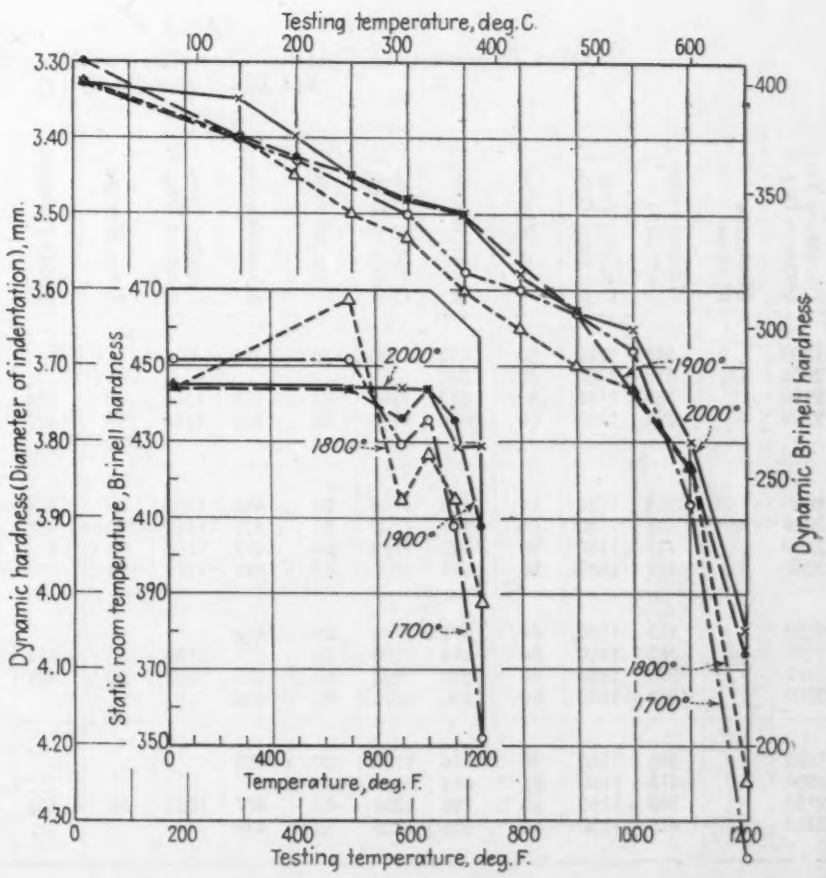


TABLE IV

Chemical Analysis of High-Speed Steels Tested for Dynamic Hardness by Oertel and Pölzguter (Fig. 6)

Steel	Per Cent C	Mn	Si	Cr	W	Mo	Co	V
a	0.70	0.30	0.25	4.5	20.3	0.5	....	1.40
b	0.81	0.32	0.31	4.76	18.76	....	....	0.40
c	0.83	0.36	0.27	4.47	13.13	....	....	0.44
d	0.80	0.32	0.32	5.06	.....	6.37	....	....
e	1.06	0.40	0.36	4.70	.....	7.27	6.76	1.37

ing temperatures. The higher the latter, the shorter the hardening time:

Deg. F.	Deg. C.	Time, Min.	Steel
1700	930	20	Cr-W-Si
1800	985	15	Cr-W-Si
1900	1040	10	Cr-W-Si and W-Cr-V
2000	1095	8	Cr-W-Si and W-Cr-V
2100	1150	5	W-Cr-V
2200	1205	3	W-Cr-V

One-half of the samples was quenched in oil, the other half cooled slowly in air on a refractory brick. One sample from all the different hardening treatments was drawn to 388 Brinell and a second set of specimens to 444 Brinell, making a total of 16 different pretreatments for each steel.

The drawing treatments for Steel A and B are given in Tables V and VI. Inconsistencies in the hardness/temperature curves can be partly explained on the basis of the behavior in the drawing treatments. The final temper hardness represents the mean value of four Brinell tests diagonally across the 2 x 2-in. surface.

The eight samples placed into an electric box-type muffle furnace, reached the lower testing temperatures in about 45 min. and the higher ones in less time. A pilot sample was holding one thermocouple; a second couple was placed directly over the samples. After obtaining the first dynamic indentation, the samples were returned to the furnace and, in about 20 min. indented a second time, followed by slow cooling in air. The indentations were measured microscopically. The mean values are plotted against temperature in Figs. 8 to 16. This method of graphical presentation brings out more clearly temperatures of rapid softening. The dynamic hardnesses are also expressed in Brinell units by means of a conversion curve obtained by testing a number of steels both dynamically and statically. The static Brinell hardness (see inserts of Figs. 8 to 15) was checked at room temperature after dynamic testing at the highest temperatures.

In the chromium-tungsten-silicon steel, the rate of softening is affected by the quenching temperature, particularly in the oil-quenched and air-cooled samples drawn to 388 Brinell (Figs. 8 and 9). As the dynamic hardness at 1200 deg. F. (650 deg. C.) becomes greater the higher the quenching temperature becomes (Figs. 8 to 11). As to the effect of temper hardness, the specimens drawn to 444 Brinell maintain their greater initial room temperature hardness at elevated temperatures and their softening rate is less pronounced than that of all samples drawn to 388 Brinell (Figs. 8 vs. 10 and 9 vs. 11). Regarding the quenching media (Figs. 8 vs.

TABLE V

Drawing Treatments of Tungsten-Chromium-Vanadium-Steel Aiming at 388 and 444 Brinell (Figs. 8 to 11)

Quenching Temperature, Deg. F.	Quenching Medium	Hardness after Quenching	Drawing Temperature, Deg. F.	Time, Minutes	Brinell Hardness	Drawing Temperature, Deg. F.	Time, Minutes	Brinell Hardness	Drawing Temperature, Deg. F.	Time, Minutes	Brinell Hardness	Drawing Temperature Deg F.	Time, Minutes	Brinell Hardness	Drawing Temperature, Deg. F.	Time, Minutes	Brinell Hardness	Final Temper Brinell Hardness
1900		545	1220	60	415	1200	30	380	....	..	...	.....	..	...	.....	..	...	380
2000	Oil	415	1200	60	388	....	..	...	....	..	...	.....	..	...	.....	..	...	396
2100		555	1180	60	514	1100	60	555	1150	60	514	1200	60	495	1225	60	380	380
2200		601	1180	60	534	1100	60	555	1150	60	555	1200	60	495	1225	60	460	...
....		...	....	..	...	....	..	...	....	..	...	1240	60	402	1250	60	396	396
1900		388	1180	60	429	1100	60	444	1150	60	388	....	..	...	....	..	...	391
2000	Air	415	1180	60	429	1100	60	477	1150	60	477	1200	60	415	....	..	...	399
2100		415	1180	60	429	1100	60	477	1150	60	514	1200	60	477	1225	60	401	401
2200		429	1020	60	514	1200	60	477	1210	95	394	....	..	...	....	..	...	394
1900		555	1100	60	472	1140	30	452	....	..	...	....	..	...	....	..	...	452
2000	Oil	555	1100	60	514	1200	60	477	1180	30	444	....	..	...	....	..	...	444
2100		578	1150	60	555	1200	60	477	1225	60	429	....	..	...	....	..	...	444
2200		578	1150	60	555	1225	60	438	....	..	...	....	..	...	....	..	...	444
1900		388	1100	60	444	1100	30	459	....	..	...	....	..	...	....	..	...	459
2000	Air	415	1150	95	444	....	..	...	....	..	...	....	..	...	....	..	...	459
2100		388	1150	60	495	1200	60	477	1225	60	444	....	..	...	....	..	...	461
2200		415	1150	60	555	1225	60	438	....	..	...	....	..	...	....	..	...	444

FIG. 12—Effect of quenching temperature on the dynamic hardness at elevated temperatures of an oil-quenched chromium-tungsten-silicon die steel drawn to 388 Brinell. Insert: Room temperature Brinell hardness after dynamic test at elevated temperature (Author).

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9, and 10 vs. 11), the differences are inconspicuous, which is not surprising insofar as the mean differences between oil-quenching and air-cooling are only 24 Brinell against 143 Brinell for the tungsten-chromium-vanadium steel. The static room temperature Brinell hardness after dynamic hardness testing at 1200 deg. F. (650 deg. C.) is also the greater the higher the quenching temperature. However, the Brinell hardnesses offer no quantitative measure of the degree of softening at the elevated temperature. In some cases (Figs. 8 and 11), the Brinell hardness after testing at 1200 deg. F. has increased, while the dynamic hardness at elevated temperature shows a marked softening.

Within the applied range of 1900 to 2200 deg. F. (1040 to 1205 deg. C.), the quenching temperature slightly affects the softening of the tungsten-chromium-vanadium steel (Figs. 12 to 15) in contradistinction to the chromium-tungsten-silicon steel. The temper hardness has the following effect: In the oil-quenched set, the specimens with the higher temper hardness of 444 Brinell preserve their greater hardness at elevated temperatures and pass through a distinct hardness maximum followed by softening, which is by far less drastic than with the samples drawn to 388 Brinell (Figs. 12 vs. 13).

The softening range of the air-cooled samples drawn to 444 Brinell (Figs. 13 vs. 15) is also shifted to higher temperatures and the hardness/temperature curves pass through a minimum and maximum as does the oil-quenched set. The sample air-cooled from 2200 deg. F. (1205 deg. C.) and drawn to 388 Brinell has completely softened at 1100 deg. F. (590 deg. C.). But if drawn to 444 Brinell, the steel reaches at this temperature a maximum of dynamic hardness, which, incidentally, is only slightly lower than that at room temperature. Concerning the rate of cooling from the hardening temperatures

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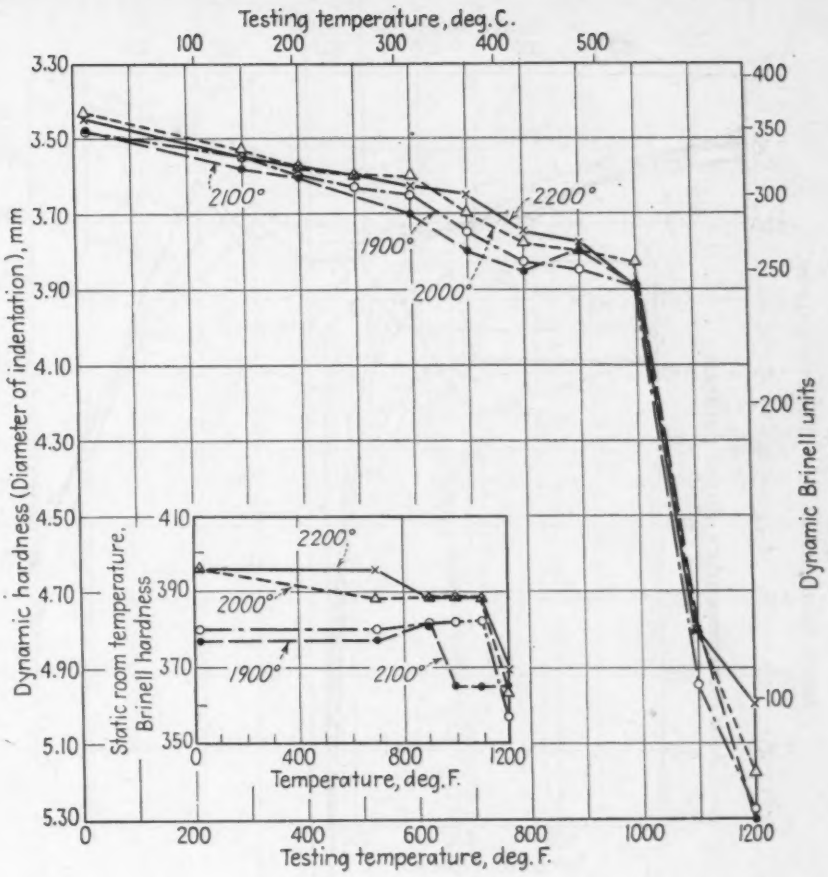
FIG. 13—Effect of quenching temperature on the dynamic hardness at elevated temperatures of an air-cooled chromium-tungsten-silicon die steel drawn to 388 Brinell. Insert: Room temperature Brinell hardness after dynamic test at elevated temperature (Author).



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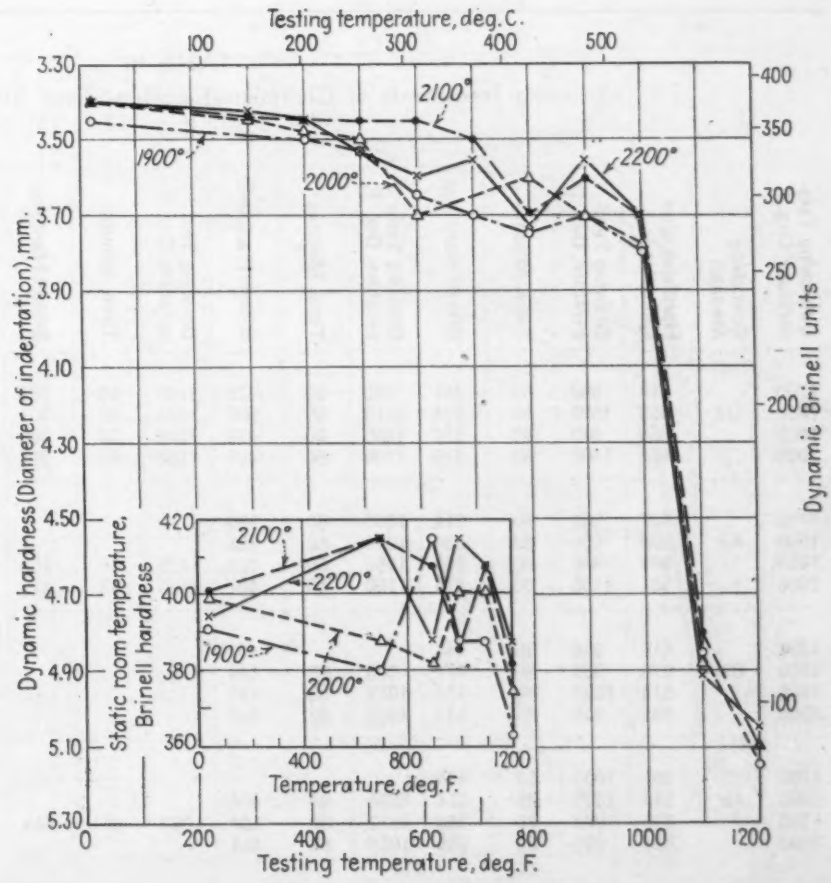

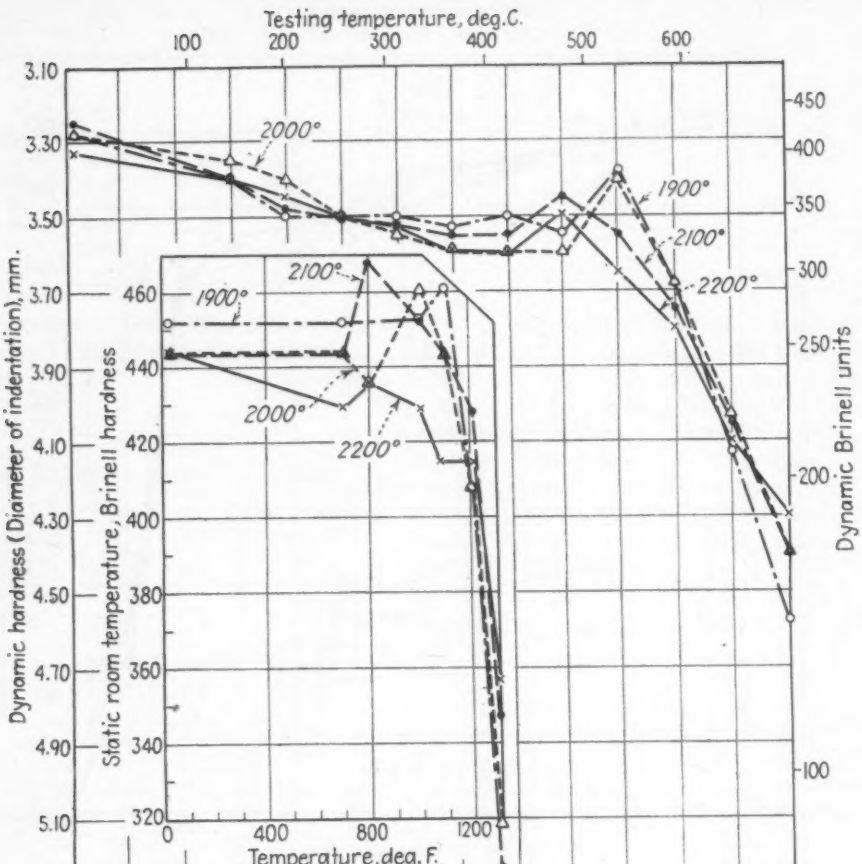

FIG. 14—Effect of quenching temperature on the dynamic hardness at elevated temperatures of an oil-quenched chromium-tungsten-silicon die steel drawn to 444 Brinell. Insert: Room temperature Brinell hardness after dynamic test at elevated temperature (Author).

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(Figs. 12 vs. 13, and 14 vs. 15), there is a slight superiority on the part of the air-cooled samples drawn to 388 and 444 Brinell up to 1100 deg. F. (590 deg. C.).

The variations in the static room temperature hardness are only partly due to the inaccuracies inherent in Brinelling such hard materials. As these variations are almost absent in steel *B*, they must be due to actual changes in steel *A*. The static room temperature Brinell hardness is again no quantitative indication of what happens at high temperatures. Complete softening may have occurred at 1100 deg. F., yet a hardness increase is found at room temperature (Fig. 13).

The softening ranges of both steels are superimposed on the same scale in Fig. 16. With the most beneficial treatment, both steels are about equal up to 800 deg. F. (430 deg. C.). While the chromium-tungsten-silicon steel *B* continues to soften, the tungsten-chromium-vanadium steel *A* passes

TABLE VI
Drawing Treatments of Chromium-Tungsten-Silicon Steel Aiming at 388 and 444 Brinell (Figs. 12 to 15)

Quenching Temperature, Deg. F.	Quenching Medium	Hardness after Quenching	Drawing Temperature, Deg. F.	Time, Minutes	Brinell Hardness	Drawing Temperature, Deg. F.	Time, Minutes	Brinell Hardness	Drawing Temperature, Deg. F.	Time, Minutes	Brinell Hardness	Drawing Temperature, Deg. F.	Time, Minutes	Brinell Hardness	Drawing Temperature, Deg. F.	Time, Minutes	Brinell Hardness	Final Temper Brinell Hardness
1700	Oil	514	950	60	461	960	60	420	1150	60	388	....	..	....	....	..	....	388
1800		555	1000	60	514	1012	60	505	1030	60	401	1220	95	388	....	..	....	388
1900		555	950	60	514	1050	60	429	1100	60	400	1220	30	388	....	..	....	388
2000		555	1100	60	410	1100	60	401	1100	60	394	1100	30	401	1100	30	394	394
1700	Air	477	950	60	514	1050	60	388	....	..	....	....	..	....	....	..	....	381
1800		534	950	60	534	1050	60	388	....	..	....	....	..	....	....	..	....	388
1900		545	950	60	555	1050	60	429	1100	60	400	1100	60	388	....	..	....	388
2000		534	1100	60	415	1100	60	401	1100	30	415	1100	30	401	1100	30	394	394
1700	Oil	514	950	95	444	....	..	....	....	..	....	....	..	....	....	..	....	444
1800		576	950	60	477	960	60	444	....	..	....	....	..	....	....	..	....	444
1900		514	1020	60	464	1012	30	444	....	..	....	....	..	....	....	..	....	444
2000		555	950	60	534	1050	60	444	....	..	....	....	..	....	....	..	....	437
1700	Air	461	1000	60	444	....	..	....	....	..	....	....	..	....	....	..	....	444
1800		514	1020	95	514	1030	95	444	....	..	....	....	..	....	....	..	....	452
1900		545	1000	60	555	1012	60	524	1030	60	444	....	..	....	....	..	....	444
2000		534	950	60	555	1050	60	444	....	..	....	....	..	....	....	..	....	444

FIG. 15—Effect of quenching temperature on the dynamic hardness at elevated temperatures of an air-cooled chromium-tungsten-silicon die steel drawn to 444 Brinell. Insert: Room temperature Brinell hardness after dynamic testing at elevated temperature (Author).

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through a hardness maximum. At 1200 deg. F. (650 deg. C.) both steels are again equally hard. Fig. 16 also shows that steel *B* is less critical in heat treating. Steel *A* begins to soften rapidly at 1000 deg. F. (540 deg. C.), if drawn to only 388 Brinell. Each steel apparently has its pros and cons. With slight modifications of the non-strategic alloy metal content, the 4.58 per cent tungsten die steel *B* could be used in lieu of steel *A* containing 11.48 per cent tungsten.

The scarcity of certain alloying elements calls for the development and testing of new substitute materials and for the modification of present brands in such a manner as to obtain a maximum of service out of a minimum of alloy additions. The dynamic hardness test offers a valuable and efficient tool in developing and large-scale testing of such new steels used at elevated temperatures.

Conclusions: Figs. 8 to 16 prove that the dynamic hardness testing method is well suited to detect critical service temperature ranges and to bring out the differences in the softening of die steels due to variations in the thermal pretreatment.

Room temperature hardness tests yield in no case a quantitative clue as to what happens at elevated temperatures. In many cases the experimental evidence is contrary, a complete softening at elevated temperature corresponding to a hardness gain at room temperature.

Contrary to deductions by Oertel and Pölzguter, the rate of softening as well as the temperature of drastic softening are materially affected by the thermal pretreatment.

Over 700 dynamic hardness determinations plotted in Figs. 8 to 16 have been made in a minimum of time and at expenses certainly lower than with other physical testing methods adapted to elevated temperature work.

Ed. Note: Next week the author concludes with discussions of cobalt-chromium alloys, Stellite and substitution alloys, nickel-chromium steels and various non-ferrous alloys.

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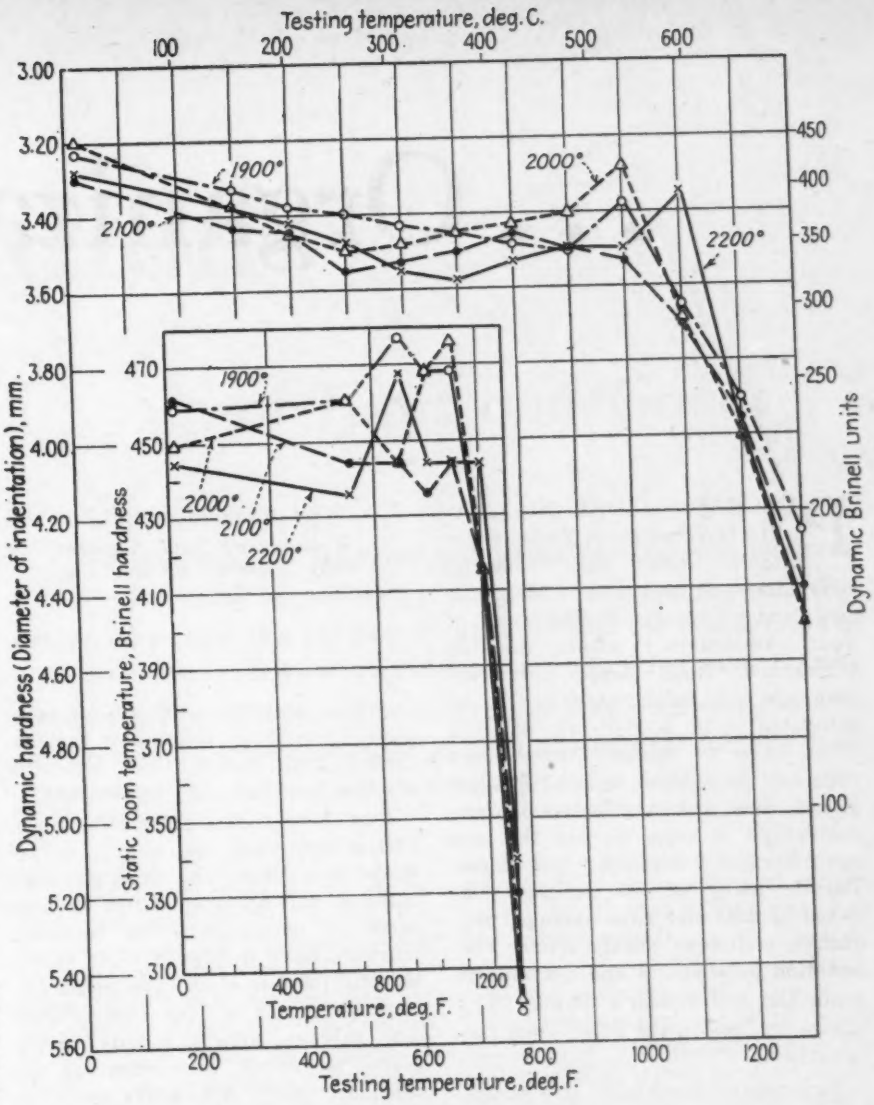
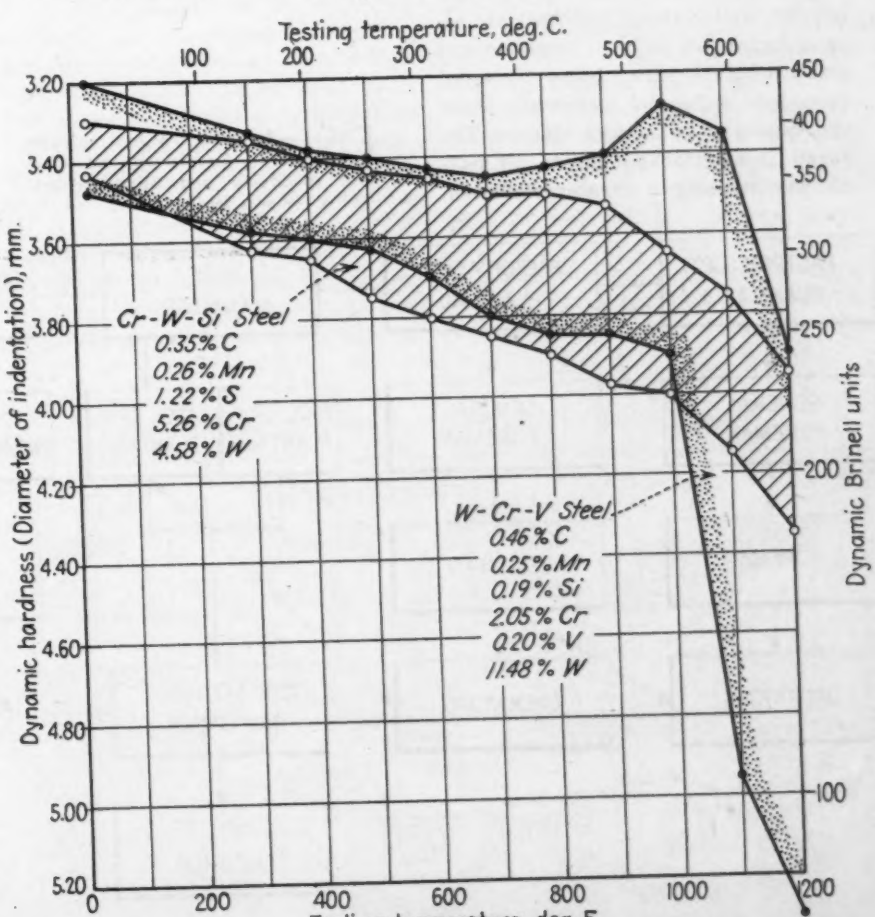
FIG. 16—Softening temperature ranges of a tungsten-chromium-vanadium and a chromium-tungsten-silicon die steel (Author).





. . . Organization for

BY JOSEPH V. KIELB
Welding and Tool Engineer, Easy Washing Machine Co., Syracuse

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PURCHASE ORDER NO. 31000 —"12 Dovetail Form Tools as per attached print." Yes! Thousands of similar purchase orders litter the tool vendor's plants. Probably one of your own orders is among this lot, earmarked "Rush please." Yet not long ago you would have had to be contented with a delivery date of from 6 to 20 weeks. Replacement tools can be ordered, but the tool engineers must avail themselves of some subterfuge in order to win the war against rapidly depleting tool stores. Despite many of the articles published on tool and gage salvage, production engineers blithly ignore reclamation possibilities and continue to drain the tool vendor's plants. Why ignore an "ace in the hole"—tool reclamation?

Experienced machinists are scarce, but the well-rounded tool men are almost impossible to hire; thus the tool manufacturers are sorely pressed from both sides and meanwhile these orders pile up at the tool vendors. The result is additional delay to all purchasers, causing a greater slowdown in their production. Why not give more thought to reclaiming the discarded tool rather than grousing about a tool that can't be obtained?

Fortunately, the difficulties in securing new tools and gages has resulted in a deeper and more thorough study of salvage possibilities by hundreds of companies. The technical journals have displayed their wares but still too few of us have tested salvage programs of our own. "That tool salvage article sounds pretty good," we admit, then scowl at the calendar. "Only five weeks more before they ship those dovetail form tools."

The development of a tool reclamation program necessitates a few fundamentals. In a program of this type, the tool manager must be aided by the metallurgist, tool designer, production engineer, welding engineer, factory managers and, last but not least, the setup operators. A separate organization is generally set up to control this program in large companies while in small companies this program could come under the production engineering department or the salvaging department. The following paragraphs explain the functions of these departmental heads in order to make a success of such a program.

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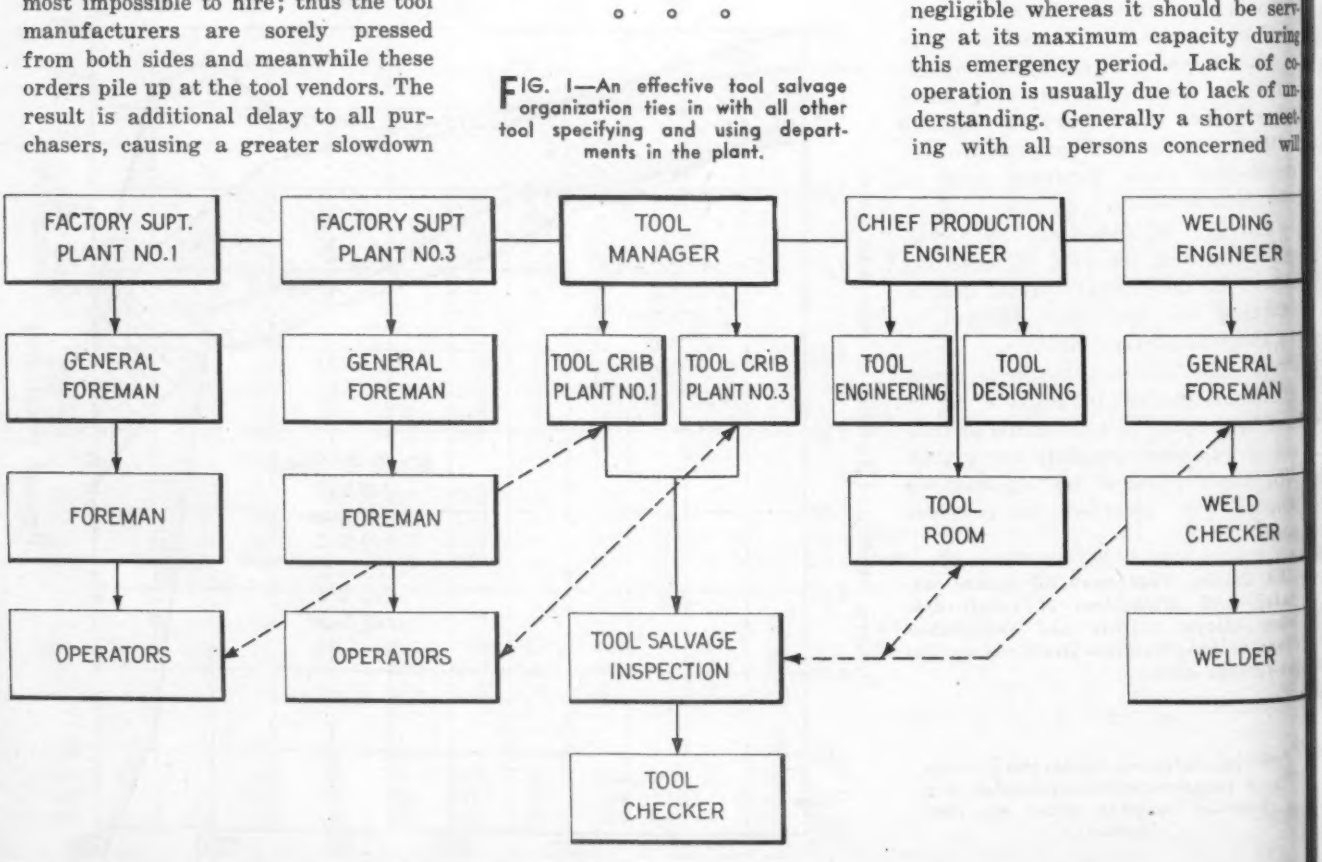
FIG. 1—An effective tool salvage organization ties in with all other tool specifying and using departments in the plant.



Organizational Cooperation

Too often, lack of complete cooperation makes this program almost negligible whereas it should be serving at its maximum capacity during this emergency period. Lack of cooperation is usually due to lack of understanding. Generally a short meeting with all persons concerned will

Reclamation

of Tools and Gages

. . . It is one thing to read and talk about tool salvage methods; it is another thing to put such a program across in a plant. The author shows how this can best be done through the cooperation of all persons involved, from tool manager down to setup man. He also demonstrates how a system of controls can be set up to check on salvaged tool performance and outlines the several salvage techniques available.

result in a complete understanding of the particular item under discussion. At that time, all facts can be exchanged regarding the procedure of salvaging different tools in the quickest and best manner possible. In a meeting of this type, the following topics are generally discussed: purpose, material, tool design, advantages and disadvantages of the tool, type of machine, machine operation, cutting fluids, methods of handling the tool, etc.

The metallurgist generally suggests to this group the type of tool steel that is to be used, its hardness, its critical temperature before and after salvaging any tool, the type of material to be cut, its heat treatment and machinability. In return, he must secure from the tool engineer data on feeds and speeds, size of cuts, type of tool and form, type of machine and its general characteristics. Many of the details of these items can be secured from the general foreman or the setup man who plays an important part in making a program of this type successful. This latter individual's suggestions should be given much consideration, and the tool engineer should understand and study them. New ideas coming from the tool engineer should be handled so that the tool setup man feels that his suggestions have been applied. When this is done, complete cooperation in the whole organization is obtained.

Lack of cooperation can develop into something like this: A few years ago, there were several critical tools salvaged but because of improper grinding, some of these tools were cut undersize in diameter while others were cut undersize in thickness. These errors were not discovered until after these tools had been set up in the machine for operation; thus after all the work that had been put into salvaging these tools, they had to be scrapped due to lack of cooperation on the part of certain individuals who thought these tools could not and should not be salvaged.

Another incident where a lack of understanding developed was in the case of carbide tool bits. Carbides of one company differ from those of another, yet the hardness and contents of the carbides will determine whether they should be applied to ferrous or non-ferrous materials. Lack of knowledge of the types of carbides, proper carbide grinding practice and tool design applications resulted in short life of these tools and caused a great deal of confusion between the carbide dispensing room and the shop. In this plant a thorough study was made of the handling of carbides which resulted in the classification of carbides, centralizing grinding, installation of proper grinding equipment, training of grinding operators and training of setup men in the handling of carbide tools. Thus the misunderstanding that existed was cleared up. These incidents are parallel to others occurring in many companies.

The welding engineer comes to the aid of this organization after the tool has been broken or worn down. If the organization does not have a man of this caliber, a man should be brought in to give his opinion on the different tools or gages that can be salvaged by welding. In many organizations where the tool engineer, tool draftsmen and other individuals familiar with tools have little knowledge of welding, it has been found that they try to determine how a tool can be salvaged without consulting a man who is a specialist in that line, and as a result, they often state that

Fig. 2—Tool salvage ticket on which all pertinent data is recorded.

<table>
<tr><td colspan="5">TOOL SALVAGE TICKET</td><td>NO.</td></tr>
<tr><td>DATED</td><td colspan="2">TOOL NAME</td><td>TOOL NO.</td><td colspan="2">TOOL DEPT.</td></tr>
<tr><td colspan="2">BREAKAGE CAUSE</td><td colspan="2" rowspan="2"></td><td colspan="2">WELDING CHECKER</td></tr>
<tr><td colspan="2">TOOL CHECKER DATE</td><td colspan="2">DATE</td></tr>
<tr><td rowspan="2">DISPOSITION</td><td colspan="2">TOOL SALVAGE</td><td rowspan="2">RETURN TO VENDOR</td><td rowspan="2">SCRAP</td><td rowspan="2">REPAIR</td></tr>
<tr><td>SALVAGE</td><td>OBSOLETE</td></tr>
<tr><td>ORDER ISSUED</td><td>REWORK</td><td>SCRAP</td><td colspan="2">NEW SALVAGE TOOL NO.</td><td>POSTED
TOOL CRIB CONT. | COST DEPT.</td></tr>
</table>

such a tool cannot be salvaged. After a thorough study is made of a particular tool, generally it is discovered to be salvageable; but if the other members of an organization do not cooperate in this program, that salvaged tool will still be useless, due to the failure of applying the proper procedure after salvaging.

Type of Organization

Companies who start without setting up a separate organization to control a program of this type will usually encounter failure in trying to secure the proper cooperation by all departmental heads. This type of program should have a separate organization which functions with every department which is handling tools. Such an integrated organization is charted in Fig. 1.

It can be seen that the whole program is centralized around the tool manager who controls tools and gages from purchasing until final disposal of these tools. He becomes the coordinator between manufacturing and production engineering. It is his job to control grinding by centralizing units throughout the plant, handling broken or wornout tools and gages, estimating life on tools and gages for each operation and keeping tool performance records. The information the tool manager possesses will aid the tool engineer in new jobs, but the tool manager should have a voice in determining the tools required for a new contract. This necessitates a study of the type of material to be cut, type of tool, feeds and speeds, cutting fluid and its application and the size of cuts. This program when applied to a new contract as previously mentioned, requires the cooperation of the metallurgist as well as the tool engineer and designer. The tool manager is essential in this setup because he can reduce downtime on machines which occurs in all plants. Thus he can aid in a more uniform production control and also create more harmony and better cooperation between manufacturing and production engineer. Certain essential controls are necessary in the managing of these tools and gages in order to make this program a success. They are as follows:

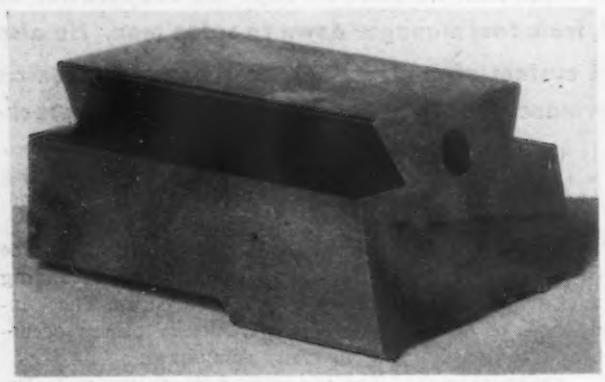
(1) Check tools on hand that could be salvaged before requisitions for new tools are issued.

(2) Use salvaged tools before new tools are released from crib.

(3) Study cause of broken tools.

a. Determine whether a tool is to be salvaged or scrapped and the cause in either case.

b. Relay this information to the tool engineer and foreman of the department.



ABOVE—LEFT

FIG. 3—A common dovetail form tool reclaimed by brazing and machining.

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RIGHT

FIG. 4—Joint preparation before arc welding of a reclaimed cutter.

(4) Maintain flow charts on new and salvaged tools.

a. Maintain complete history of a tool from the day it enters the plant until it is scrapped. Index cards can be used for this purpose.

b. In following up salvaged tools, daily records should be kept in order to check their life.

c. Charge particular tools against the department and operation.

(5) Establish standardized tools.

(6) Assign assistant to tool manager to follow up all tools.

Efficiency of production control depends directly on the efficiency of this tool salvaging organization as a working unit.

A great deal of follow-up is essential in this program in order to find out whether a tool can be salvaged and whether it has proven its value. In many instances, tools can be salvaged where the cost might be slightly higher than the original cost of the tool, but the saving of downtime on machines makes this tool valuable from a salvage angle. However on most tools that are salvaged, the cost is far below that of the original cost of the new tool. The follow-up study usually reveals these cost factors, but too often there is lack of such information in the tool salvage organization. Another duty of the follow-up man is to chase tools that have "died" before reaching the machine, due to the lack of proper grinding machine maintenance, poor tool grinding practice or discarding the tool before careful examination.

To show how the organization charted in Fig. 1 works, let us follow a particular tool. Suppose a milling cutter is broken into pieces. The milling machine operator involved informs the foreman of that department. The foreman in turn takes this tool back to the tool crib where a tool salvage ticket, as illustrated in Fig. 2, is placed on this tool. In the tool crib, the tool checker determines whether this tool can be salvaged or whether it will be scrapped. He also determines the causes of the breakdown of this tool and informs the foreman, who in turn informs the operator why this tool was broken. Copies of the salvage ticket are sent to the general foreman as well as the plant manager. Also, the tool manager informs the chief production engineer and the welding engineer about a tool that is to be salvaged. If salvageable, this broken tool, after inspection, will go to the machine shop if any parts have to be machined, or it might go directly to the welding department if the fitup is such that it does not require any machining.

In the welding department, the tool is checked and placed in the proper fixture to be welded. After this is done, the tool is returned to the tool manager, who in turn checks setup and if any machining is necessary it is returned to the machine shop. This tool is then recorded and placed in the tool crib under the department or tool number in which it is going to be used. This tool is then issued when the operator next calls for a tool of that type. The follow-up man under the tool manager keeps daily contact with that tool until it is finally scrapped. All of this information is recorded on the flow charts of that particular tool.

A similar setup exists in the handling of gages which are generally scrapped due to wear rather than

breakage. Where gages wear down rapidly, particularly plug gages, carbide tips are inserted on the wear area in order to prevent this condition developing again in the gage.

On one job, for instance, where the production is high and 100 per cent inspection necessary, an ordinary plug gage became undersize as much as 0.0001 in. within an hour. By inserting carbides on the plug gage, it was used for a period of seven weeks. It was checked at different intervals and it was found that there had been no detectable wear on this gage during that period. This proved to be very profitable as well as a very efficient means of maintaining production control.

Tool and Gage Salvaging at "Easy"

About a year ago, a program for salvaging critical tools was started at Easy Washing Machine Corp. In starting this program, it was necessary to explain the purpose to everyone concerned with handling tools. At first many were of the opinion that the majority of these tools could not be salvaged, but by showing them results of similar programs conducted by other companies and by the actual illustration of repairing a few samples, they were convinced that such a program was essential.

The start of this program was the replacing of carbide inserts on Sil-Man shanks. Many of the new tool bits had broken off at the start of an operation due to poor brazing, and therefore had to be rebrazed or the bits replaced entirely. Several hundred Sil-Man shanks had accumulated over a period of time and the question arose whether it was cheaper to buy standard tool bits or just buy the carbide inserts and place them on the accumulated shanks. The latter step was chosen.

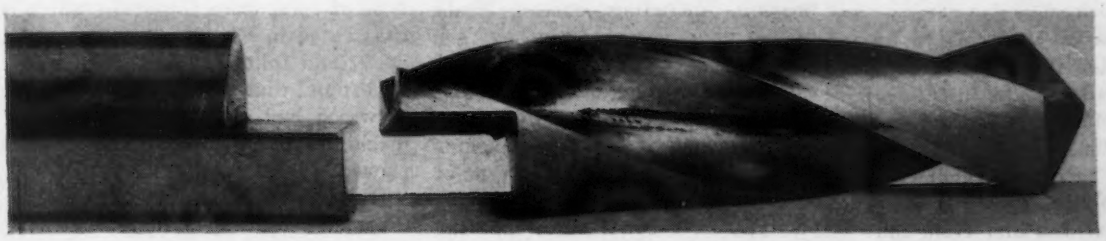
Brazing the carbides to these shanks made these tool bits standard, which instituted the first step toward the purchase of standard tool bits. For example, a ⅝ in. tool bit average cost is $1.90 as a standard tool, but buying only carbide inserts, which cost approximately 58c., plus 12c. for brazing and 20c. for tool room milling of the surface of the tool bit before brazing, resulted in a total cost of 90c. for replacing that tool bit in the standard category. A saving of $1 per tool resulted in this installation, and over a period of a month several hundred dollars were saved on this one item alone.

One of the first difficult tools on which experimentation was started was the common dovetail tool, Fig. 3. This illustration shows the salvaging of the tool by the use of a mild steel block brazed to the back end of a high speed dovetail tool. Large quantities of tools of this type are used by the company. Delivery dates on such tools were especially long and in order to prevent downtime on these machines, a procedure was worked out whereby we could salvage this tool. A definite procedure was also set up and applied to any other similar tools.

At the start, gas welding was employed for brazing of these tools. The welding wire was a low temperature brazing alloy wire with a melting range of between 1150 and 1250 deg. F. The first few tools proved quite successful although a few failures resulted, due to the fact that the bonding metals between these two materials was not perfect. Brazing strip material was then used, which resulted in giving better bonding of the joint. Another method of using constantan with strips of Easy Flow No. 3 between the tool steel and the mild steel block was later applied on certain form tools. This proved very successful, and was set up as one of the procedures in handing these tools. Later, induction welding of these tools replaced the gas welding method and gave a more uniform heat in the desired fusion areas and also prevented any cracking of the tool steel.

It was found that the thermal coefficient of expansion of the three metals—mild steel, tool steel and brazing wire—was different, and on some occasions setting up of internal stresses in the bonded area developed, resulting in the breaking of this welded tool in that area.

Two essential items of saving are involved in this tool as well as any other tools that will be described in later paragraphs. First and most important was the elimination of downtime on machines and corresponding idle time for direct labor. The second item is cost saving. The approximate cost of this new dovetail tool ranges from $40 to $50 and about half of this tool is discarded due to the fact that the stub end cannot be held in the form tool holder. The value of this discarded tool is approximately $20 or $25, which is reclaimed through this salvaging program. The cost saving on other tools ranged from $1 to $145, but in most cases the downtime of the machines was more important.



ABOVE—LEFT

FIG. 5—This type of lap joint on a large drill gives greater welded area for greater tensile and fatigue strength.

RIGHT

FIG. 6—Minimum machining preparation of this large drill is obtained by a square butt joint.

Important Factors in Salvaging

There are several items of importance that should be observed if successful salvaging of this tool or any tools is to be obtained:

(1) Fitup of the welded joint. Where the break of the tool is clean and the piece can be fitted perfectly, leaving a clearance of from 0.001 to

0.003 in., no machining is necessary to produce proper fitup. At all times, when using a low temperature brazing material, in order to obtain the maximum strength the joint should have a fitup of 0.001 in.

(a) Proper fixtures for alinement of tools is essential. Care should be taken not to apply too much pressure on the welded joint. It has been found that two pieces forced in compression will have a tendency to break apart due to the fact that internal stresses are set up caused by high rate of cooling in the welded area.

(2) Cleanliness of the tools to be welded. Very often this point is neglected and generally results in failure of the welded joint.

(a) Preparation of the joint by cleaning with carbon tetrachloride or any other solution that will eliminate grease, oil and dirt from the surface of the steel.

(b) Use of sufficient flux before fitting pieces in the welded areas. This flux may be placed around the tool to prevent oxidation developing on the surface of this tool caused by the heat of the torch. It will also aid in cleaning the tool much more rapidly after welding.

(c) Make sure welding surfaces are not smooth machined. It has been found that mirror-like surfaces give poor fusion in the welded area.

(3) Method of welding.

(a) *In gas welding* of these tools, care should be taken in flame control in order to prevent the overheating of the tool steel in the welded area. This might cause reduction in hardness of the tool steel, and in addition hair line cracks may develop in the tool steel. Too rapid heating will tend to cause poor welding of the tool; unwelded areas in center of the tool may result. The size of tip of the torch and the amount of gas pressure on the torch are also important as is maintaining the proper flame, which should be neutral or slightly carbonizing. Avoid an oxidizing flame.

(b) *Tool salvage by induction heating.* This method has eliminated the welding heat control problems that exist in the handling of those tools. The conception of welding heat temperatures varied so much between individual welders that on several occasions the hardness of the tool steel was reduced, due to slight annealing of the fusion area of the tool steel. In induction welding, the timing cycle is controlled automatically and thus controls the heating temperatures. Proper designing of coils to fit the tool to be salvaged is important. Although this coil preparation involves a little more study and work, if the production of tool salvage is high enough, it will repay the cost of this preparation. At "Easy," where induction brazing has been done for some time, various types of coils have been designed for welding of carbide tips to steel shanks. The design of the coil generally differs a little in all companies and as such is an individual problem.

Practically any kind of small tool can be handled through induction brazing, including cutting tools, drills, plug gages, broaches, end mills, form cutting tools, drill shank extensions, milling cutters, carbide inserts, etc. It is important to have a large enough induction machine in order to handle most any type of tool. With machines of small capacity, it has been found that the time cycle increases proportionately and hence the heat is transmitted to the tool steel area, which reduces the hardness of the tool steel. The general hardness maintained for these tools is around 63-65 Rockwell C. A great deal of thought and study should be given to this method as it has a wide scope in the brazing of tools as well as its application for production parts.

(c) *Arc welding of tool steel.* A great deal of care has to be taken in order to arc weld tool steel to mild steel successfully. Proper heat controls, types of electrodes, annealing, preheating and quenching are involved under this method of handling. Fig. 4 illustrates the arc welding of a high speed steel cutter to a high speed steel shank which has been annealed. After trying many types of electrodes, the most succesful proved to be Ampco aluminum bronze electrode. Even with this electrode, care had to be taken in the welding technique as there was a tendency of cracking in either wall if too much whipping of the electrode was done. Other types of tools have been salvaged through arc welding with special high speed tool steel electrodes, but special preparation before and during the welding of the tool steel had to be taken.

(4) Proper cooling of tools. Too rapid cooling or chilling will have a tendency to cause a break in the tool steel or the welded area. Keeping the tool out of drafts or protecting it by some type of cover such as asbestos, lime, etc., result in slower cooling and will give an excellent welded joint.

(5) Machining of these tools is generally at a minimum and on some occasions where other than low temperature brazing materials are used, great care should be taken in machining the surfaces of the welded area both before and after welding. It is generally advisable to leave a reinforcement weld as a protective means in the fusion zone where the joint has been chamfered, but is not essential if the welded area has been properly handled.

As illustrated in Fig. 5, the salvaging of this drill required more machining than is generally necessary, but it tended to develop a stronger type of joint than the setup which is illustrated in Fig 6. After a careful study and follow up of these tools, it was found that the tool shown in Fig. 4, which had a minimum amount of machining, served the purpose and proved successful. This procedure, therefore, was set up as standard for that particular operation. The type of joint as illustrated in Fig. 5 was applied to small drills and several hundred extra long drills, Fig. 7, were salvaged using this type of joint. This proved to be the most economical and efficient for the particular operation involved.

Plug Gage Salvage

With regards to gages, it was found that many plug gages wore down very rapidly. Fig. 8 illustrates several plug gages with different types of carbide inserts. As mentioned previously, it was found that this method proved very successful, which eliminated rework on many hundreds of plugs and in addition, the purchase of new gages. It relieved the tool room of much grinding work and aided in increasing production inspection. Many of these gages were in operation as long as three months without any wear of the outside diameter of the gage.

In Fig. 8, plug gage *A* illustrates the application of carbide blanks that were available in our plant for immediate service. Carbides ⅞ in. square were placed on the sides of this plug gage, which had flat surfaces machined on it. Grinding difficulties were encountered after brazing due to these carbides being square; but if circular carbides of 1-1/16 in diam. had been purchased, it would have been several weeks before we received them. The nature of this job warrants the setup shown, which prevented any downtime on production inspection. Plug gage No. 2 *B* illustrates another emergency solution. In this case four pieces of ⅝ in. square carbide were brazed on the end surface of the diameter of this plug gage. Although in this job too, excessive

Fig. 7—Preparation of small drills for machining and brazing with extended shanks.

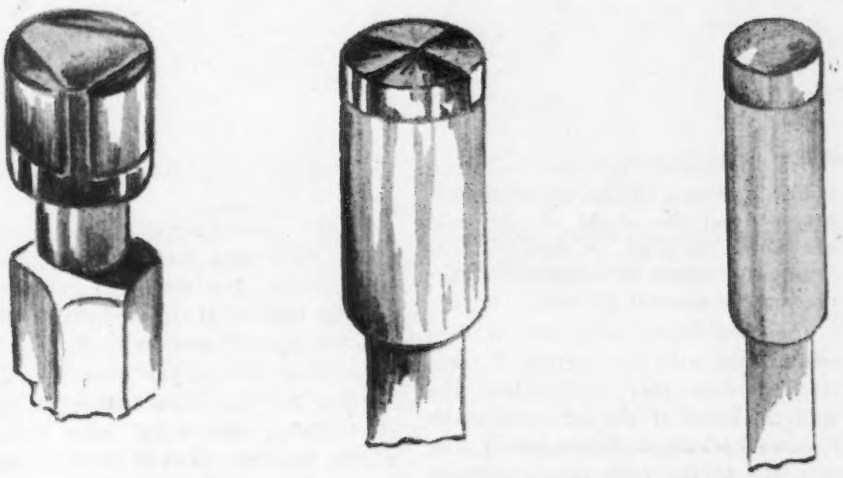


FIG. 8—Three methods of reclaiming plug gages with carbide inserts on the wearing surfaces.

grinding was necessary due to the oversized carbides, the importance of salvaging this gage immediately outweighed any other factors, as it prevented downtime of production. Once these gages were in service, they aided in reducing grinding time in the tool room on ordinary plug gages. Plug gage No. 3 *C* was the first gage used in this program. No round carbides were available but a ⅝ in. sq. carbide was placed on the end surface of the plug gage. After grinding this gage down to the proper size, it was in service many months without any wear.

Carbide inserts did an excellent job. Occasionally, on small diameter plug gages of 1/16 to 5/32 in. diameter, difficulty was encountered in brazing and grinding. It was not the brazing of the carbide insert, but generally the placing on the carbide of a temporary steel bar which was used for centering the gage while grinding, that caused a little trouble. Carelessness in grinding, such as rough handling and using the wrong grinding wheels, resulted in overheating of the carbide, thus causing the carbide to crack, and it also broke the fusion zone area. It was found that a training program was necessary in order to have proper handling in the grinding of carbides.

The wearing down of the original tool steel plug gages as fast as 0.0001 in. per hr. caused six and seven gages to be used per shift on that particular job. In several cases "Easy" salvaged many of these plugs by chrome plating. Both practices are now used, depending on which one is best suited. In the use of circular carbide inserts it is advisable to use only those which are 0.001 or 0.002 in. oversize. This keeps the amount of grinding in the tool room to a minimum. The problem of grinding these plug gages after brazing the carbide proved to be difficult at the start, but this trouble was eliminated by inserting and brazing a small piece of mild steel bar stock in the center of the carbide, using it as a temporary grinder center. A great deal of care had to be taken not to apply too much heat to this little piece of steel so that it would not break the bond of the carbide tip with the plug gage. The steel extension was removed after the gage had been turned down to the required size.

In most all the tool salvage operations, women welders are employed. It has been found that they have a more sensitive touch in doing fine work such as is required in this program. Close supervision over these welders is necessary, particularly on a new job.

The illustrations as shown are only a few of the many types of tools that Easy is reclaiming in order to assist in the war effort as well as to help themselves in overcoming this shortage of critical tools. Good organization is necessary to keep this program at its peak, but unless the cooperation of all concerned is secured, a salvaging program cannot be accorded its full importance. Although we are far from our goal in this tool salvage program, every day more and more tools are being salvaged, thus eliminating the necessity of purchasing new tools in such great quantities.

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Problems and Developments of a Wartime Steel Foundry

IN a paper for the Fortieth Annual Conference of the Institute of British Foundrymen, E. D. Wells and A. Johnson discuss experiences in steel foundry practice under wartime conditions.

Using Poumay cupolas which have small main tuyeres and subsidiary preheating tuyeres, the maximum proportion of steel scrap in the charge was 90 per cent, the other 10 per cent consisting of 4 to 5 per cent silicon iron; so high a percentage is possible with scrap of only the best quality. The Perrin process of dephosphorization was tried on metal containing 3.5 per cent of carbon. Slag was melted in an electric furnace and the cupola metal tapped onto it from a considerable height. A violent reaction started immediately and both slag and metal boiled out of the ladle. The dephosphorization achieved was negligible and the experiments were discontinued.

A lining of ground stabilized dolomite made up with 6 per cent of water and rammed round a former was tried for the desulphurizing ladle in the soda ash process. The results showed better average desulphurization, greater regularity, but a poor lining life, rendering this material uneconomical. Experiments using unstabilized dolomite are now going on and it is believed that a satisfactory basic lining for desulphurizing ladles will be developed.

The advantages of using the whirlgate head have been found to be: Better positioning of the heads and the small ingates means less oxy-acetylene cutting and grinding on the castings; an increased yield of castings from a given amount of liquid steel can be obtained by feeding up to four small castings from one centrally placed whirlgate head; by taking advantage of the temperature gradients of the steel, smaller heads can be used, and cleaner castings can be produced.

Tubes and Tube Making

LAST week it was shown how it became possible to make comparatively short and thick-walled tubes (2¼-in. o.d., ⅜-in. wall and 3-ft. length for instance) by means of barrel and cone type piercing mills. Tremendous difficulties, however, arose in the attempt to make longer and thinner tubes. The inability to make them eventually threatened to impede the success of the entire process.

Many attempts to lengthen the short tubular shells by way of hot rolling in conventional rolling mills over inserted solid bars, which often could not be removed after the rolling operation, proved unsuccessful. So did a process in which the shells were hot rolled after being filled with sand or a mixture of sand and charcoal with the two ends sealed, a procedure which often resulted in explosions.

Eventually, another fundamentally new and important process to reduce the wall thickness and to lengthen the tubes was invented. This was the so-called Pilger step process.* It must be understood that this is not a piercing process but a process to reduce the wall thickness of tubular shells already pierced.

** Occasionally the term "Pilgrim" is used to describe this process. It is merely the English equivalent of the German "Pilger."*

The operating principle is illustrated in Figs. 14 and 15, while the process and the shape of the rolls are shown in Figs. 16 and 17. The latter also shows the stop collar regulating the amount of feed.

The two Pilger rolls are so contoured that with one portion of their circumference they will reduce the wall thickness of the tube and make it move backward. Subsequently, the contours of the rolls recede without touching the tube surface. During this performance the tube is being pushed forward by as much of its length as it was reduced during the preceding revolution plus approximately the reducible length of the following revolution of the rolls. In each forward movement the tube is turned by 90 deg.

This rolling by steps, in which the tube is carrying forward and backward motions, has been likened to the so-called Jumping Procession of Echternach (Echternach in Luxemburg) whose ritual required the atoning pilgrims to take three steps forward and two steps backward; thus the derivation of the name of the process.

The problems left to be solved in order to permit a successful employment of this novel reciprocating rolling process were: To find the appropriate contour and size of the rolls and to master mechanically the kinematic difficulties, that is, those arising from the alternating and rotating motions.

In the first experiments long solid shafts were used for mandrels, these were later replaced by shorter, slightly tapered shafts and eventually by long, tapered mandrels.

In order to find the most suitable contour for the rolls before rolling steel shells, lead tubes were rolled which, however, showed entirely different elongations, Instead of the desired lengthening of the tube it often occurred that the tube walls spread and formed transverse ridges. The ridges were sometimes so high that they prevented the backward motion of the tubes. Such defective tubes, because of their transverse ridges, were nicknamed "bamboo canes."

Dozens of different roll shapes were tested, with single and double transversal swellings, with different cones, tapers, grooves and hand cut threads. It was ascertained, too, that both satisfactory lengthening and smoothness of the reduced tubes depended on the ratio between the diameter of the rolls and that of the tubes.

The first "mechanical" solution of the complex movements this process required was accomplished manually. The photograph in Fig. 18 shows three workmen holding the tube together with the mandrel at the beginning of the engagement of the rolls.

FIG. 14—Schematic presentation of the operating principle of the Pilger step process.

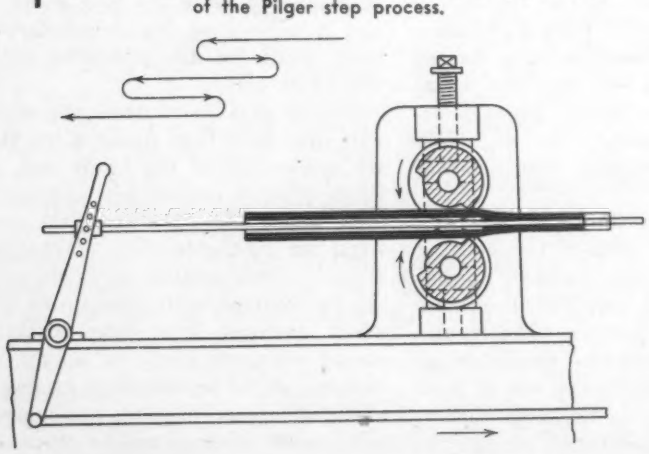
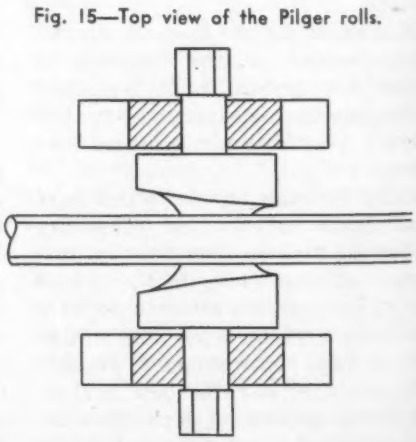


Fig. 15—Top view of the Pilger rolls.



—Development of an Industry

By DR. BERNARD P. PLANNER

. . . The progress in tube making is continued with a description of the Pilger step process for reducing the wall thickness of tubes already pierced. Important developments in the making of welded tubing are also discussed.

In this instance the tube is being rolled toward the workmen.

In Fig. 19 is shown the tube just after the working pass, with the workers about to turn it by 90 deg. and to push it back into the mill. Needless to say that this manipulation was not too pleasant for the workers, who not only had to bear the heavy weights of tube and mandrel but also were exposed to vehement concussions during each engagement of the rolls.

Feeding Mechanism Improvements

Almost every invention made before 1900 in connection with the Pilger step process dealt with the mechanical solution of the kinematic problems involved.

A feeding mechanism, dated 1891, is illustrated in Fig. 20. Fig. 21 shows a construction where, in the attempt to make the diameter of the attacking rolls as small as possible, four small pilgrim rolls are mounted on larger rolls, called planetary rolls. This was, however, far too delicate a construction.

A reversion of the applied movements is diagrammed in Fig. 22. The whole rolling mill is mounted on a sliding sledge moved by crank arms. The movement of the rolls is effected through their connection with the sledge by means of a rack and cog wheels.

Feeding mechanisms that were in use for a number of years are depicted in Figs. 23 and 24. Fig. 23 shows a spring being employed as the propelling force. During the engagement of the rolls the tube with the mandrel D, and the long bar D^1 attached thereto, would move to the right compressing the cylindrical spring. As soon as the recession would release the tube it was pushed to the left through the expansion of the spring. As the rolling of the tubes took place by steps the sledge S, that bore the feeding mechanism, had to be moved to the left during each rotation. At first this movement was carried out by hand, as described above, subsequently this was done by means of a counterweight. Fig. 24 shows a cylinder, filled with air, gas or steam, meant to replace the spring in the performance of the back and forward movements.

How the 90-deg. rotation of the working piece was brought about is illustrated in Fig. 25. The end of the rod D^1 was fitted with flat screw threads resting in a fitting nut. An appropriate locking mechanism prevented any rotation of the rod during the rolling, that is during the movement to the right. During the backward push, the movement to the left, the rod was caught in the nut so that the required rotation by 90 deg. could take place. There have been many similar constructions in a number of which steam was used as driving power.

It will be understood that with the use of springs and air as propelling and buffer agents vibrations of the feeding mechanism were unavoidable. The rolls could therefore not catch the tube after exactly the same amount of feed and irregularities became unavoidable. In order to overcome these difficulties a water cataract brake was developed which at the end of the back stroke kept feeding mechanism and tube immovably together.

Most of the patents and improvements developed until 1900 dealt with the feeding mechanism. Thereafter, owing to the demand for thinner-walled and longer tubes, the problem of the contours of the Pilger rolls presented itself again. In order to achieve a perfectly regular elongation of the thin tube walls the contours of the rolls required the utmost attention.

It should be mentioned in this instance that in the early twenties the casting of round, hollow billets of

Fig. 16—Simple operating diagram of the Pilger step mill.

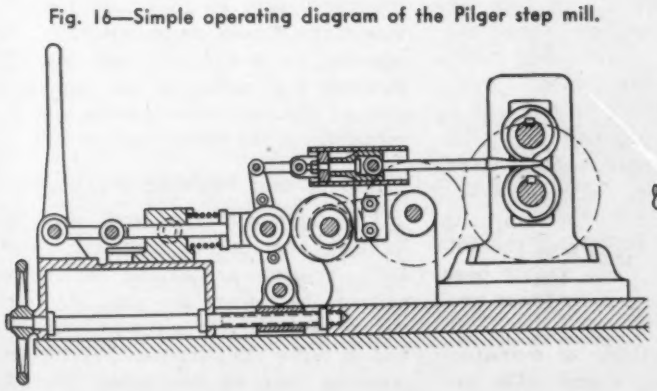


Fig. 17—Pilger rolls and limiting flange.

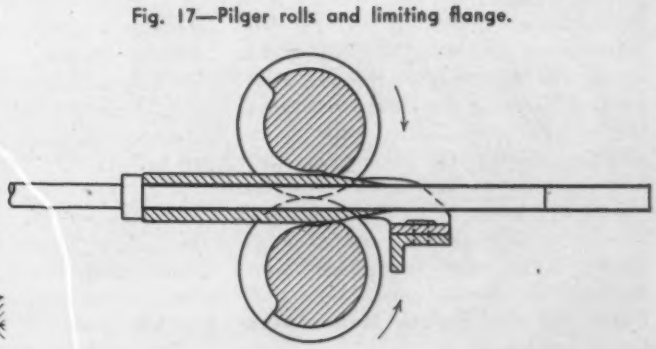


FIG. 18—When first developed, the Pilger step process was operated manually. Here three workmen are holding the tube together with the mandrel at the beginning of the engagement of the rolls. The tube in this case is being rolled towards the men.

FIG. 19—After the tube passes through the rolls, the men turned it 90 deg. and pushed it back into the mill.

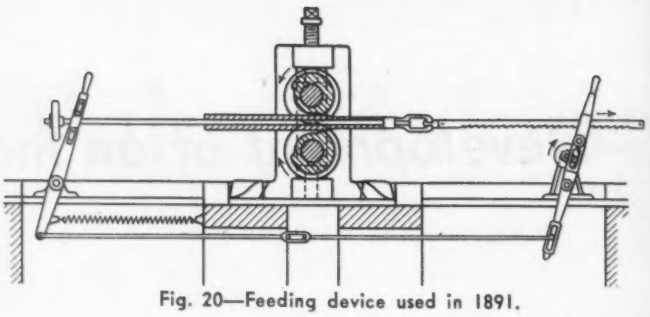


Fig. 20—Feeding device used in 1891.

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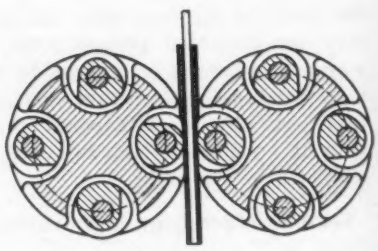
FIG. 21—In order to reduce the diameter of the rolls, four small planetary rolls were mounted on larger rolls.



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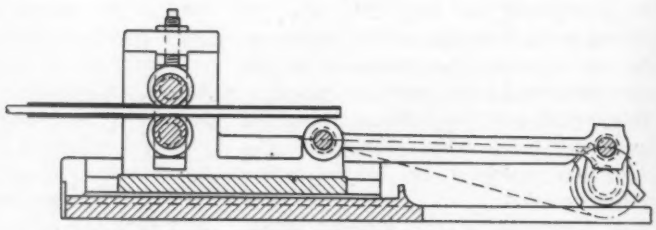

FIG. 22—To reverse the movements of the rolls, the entire rolling mill was mounted on a sliding sledge moved by crank arms. Movement of the rolls was effected through their connection to the sledge by means of a rack and cog wheels.

2 to 3 tons weight, reducible in Pilger's step mills, was successfully performed.

Formation of Continental Combine

In 1893, the Mannesmann brothers, unable to meet the growing financial requirements of their still unprofitable processes and enterprises were compelled to sell their patents and interests. They severed all ties with their former company which was taken over by the Deutsche Bank. Under the direction of this most important German banking institution the company expanded quickly. In addition to the old mills, the then largest of which were at Komotau (a town in what later became the Czechoslovak Republic) and at Remscheid, two new companies were formed, the Société des Métaux in Paris and the British Mannesmann Co. in London.

In World War I these two companies were sequestrated and taken over by a French and British group respectively. On the Continent additional mills were opened at Bous and Saarbruecken (Saarland), Schoenbrunn (Czechoslovakia), Witten (Germany), Dalmine, near Bergamo (Italy), and, most important of all, the large integrated steel works at Duisburg-Huckingen and at Duesseldorf-Rath in Germany. To date, this combine probably has an overall production capacity of well over 1,000,000 tons of pipes and tubes.

A large disk type expansion mill at Duesseldorf-Rath turning out pipes up to 1500 mm., approximately 60 in. o.d., is shown in Fig. 26.

As far as the writer is aware, in the United States the use of the Pilgrim's Step process has partly been discontinued because of its lower production speed.

The modern methods of manufacturing seamless pipes and tubes are combinations of either single or double rotary piercing operations in barrel or disk type piercing mills followed by rolling over plugs, reeling over cylindrical mandrels, and reducing, sizing and straightening operations. Many years' experience and the great progress made in the knowledge of metallurgy, together with the steady improvement of the various processes and in mill construction, now make it possible to determine the appropriate quality of steel and the methods best suited for the manufacture of the particular grades and dimensions of the tubes desired.

Shaping and Welding Procedures

The introduction of coal gas for lighting purposes in England, about 1815, created a demand for tubes suitable to convey the gas. At first old musket barrels screwed together had to serve the purpose. Yet the increasing demand for tubes, though

their employment was for some time confined to the passage of gas and water, stimulated inventors.

Following some inventions of lesser importance, Cornelius Whitehouse, an Englishman, found, in 1825, a method to manufacture welded wrought iron pipes by means of simply drawing strips of white hot flat plate, called skelp, through a die or bell, thus forming and welding pipes in one single operation. This method (Fig. 27) became the basis for the present butt-welding process for tubes from ⅛ to 3 in.

This conventional welding method was used for nearly 100 years until a basically new process was introduced. During that long space of time the old process had, of course, been greatly perfected and refined, for instance by doubling the length of the furnace, the addition of descaling and straightening devices, an elaborate system of temperature control, etc., yet still it remained the old intermittent welding process.

The fundamental change in the butt welding of pipes was brought about by the invention of John Moon, an American, who developed a continuous pipe welding method, known as the Fretz-Moon process,* for which patents were granted in 1923.

**The Iron Age, March 28, 1940.*

In this process an endless ribbon of metal is rapidly heated in less than 30 sec., by means of hundreds of small gas burners in a furnace now up to 160 ft. long. The function of this furnace is rather that of a blow torch. The strip, on whose edges the flames of the small burners impinge, leaves the furnace at a temperature of approximately 2400 deg. F. Upon leaving the furnace the strip is bent into tubular shape and finally pressed together and welded by a series of rolls. During the forming operation jets of air are being shot onto the edges of the skelp in order to increase the temperature of the strip by at least 100 to 200 deg. F., thus bringing it up to the proper welding temperature and causing the loosening of scale. In this continuous process, employed for tubes up to 4 in., "endless" strip is used instead of the single lengths (about 20 to 40 ft.) of skelp in the conventional process. So no ends need be cropped, and due to the extremely rapid heating the scaling loss is lowered. The result is an overall yield of 95 per cent, 3 to 12 per cent higher than that of the conventional process. The production capacity of a Fretz-Moon mill is 4 to 15 times greater than that of a conventional butt-welding installation.

The forming of the tube within a bell takes place without internal support. The wall thickness of the tube and its diameter must thus be in a certain ratio to each other. A tube with too thin a wall cannot be drawn or will collapse when subjected to this process. Also, due to the fact that the entire tube has to be brought up to the welding temperature, only tubes with a more or less rough surface can be made in this manner. Lastly, since a welding furnace is a large installation a large output is the prerequisite for economic operation.

For these reasons early attempts were made in this country to bend

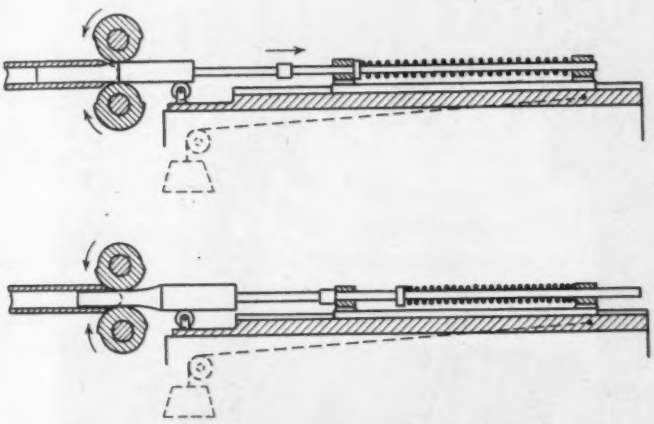

FIG. 23—Feeding mechanism propelled by a spring. During the engagement of the rolls the tube with mandrel D and the long bar D¹ attached thereto would move to the right compressing the cylindrical spring. As soon as the recession would release the tube it was pushed to the left through the expansion of the spring. As the rolling of the tubes took place by steps, a counterweight moved the sledge S that bore the feeding mechanism to the left during each rotation.

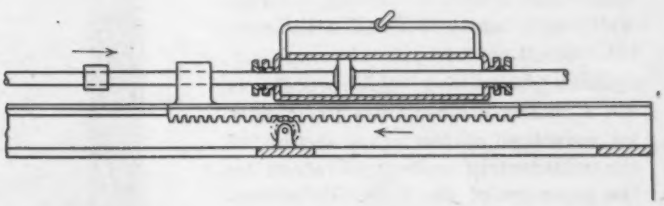

FIG. 24—Here an air-filled cylinder replaces the spring in moving the rolls.

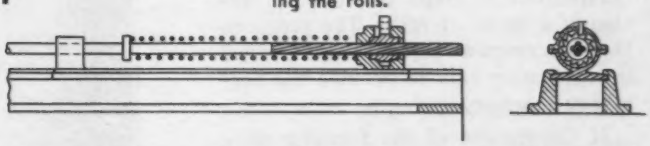

FIG. 25—To rotate the tube 90 deg., the end of rod D¹ was fitted with flat screw threads resting in a fitting nut. A locking device prevented rotation of rod during rolling. When the tube was moved to the left, the rod was caught in the nut so that the necessary rotation could take place.

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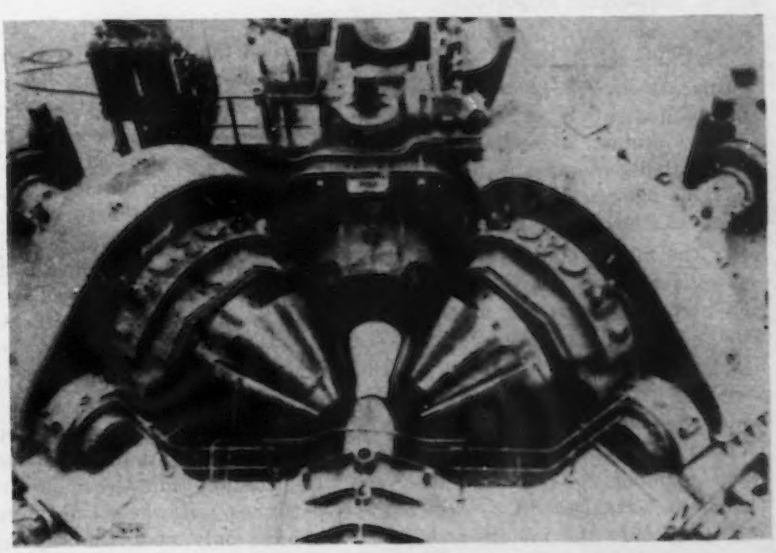
FIG. 26—Modern disk type expansion mill at Dusseldorf-Rath, Germany, used in 1938 for tubes up to 60 in. o.d.



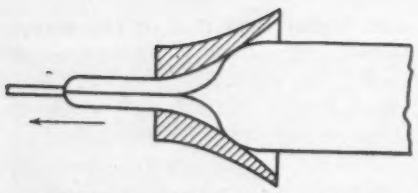


FIG. 27—Drawing skelp through a die to form and weld pipe in one operation.

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cold strips gradually within forming rolls in the direction of the axis of the tube, subsequently welding them together. A series of rolls employed in forming the flat strip into cylindrical shape is shown in Fig. 28, while Fig. 29 illustrates the different shapes the strip takes under the action of different pairs of rolls.

As the quality of the product is strongly influenced by the various methods of tube roll-forming it seems well worth while to dwell a little on the subject.

Strictly speaking, this process is not a rolling process since practically no reduction of the cross section of the rolled strip is brought about by the pressure of the rolls. Roll-forming is a gradual bending operation carried out in steps through the action of a series of rolls. The pressure the rolls exert at certain points serves in most cases only to provide the necessary traction.

If the system of the forming rolls is faulty, that is their shapes and arrangement are incorrect, the result will be: Imperfect roundness, flat spots and internal stresses causing bowing and warping of the tube. Contractions, particularly in the welding zone, must be carefully watched. Thus, a correct and absolutely accurate contouring of the forming rolls and a faultless forming roll system are of paramount importance.

Three basically different methods of forming-roll contouring must be distinguished. Fig. 30 presents a simplified illustration of them for the simplest section, a round tube. More complicated sections are cold rolled in the same manner by a repeated application of the principle described.

By the first system both the forming rolls make a fairly uniform contact across the surfaces of the strip. The characteristic feature of the second system is that the sides of the strip are gripped near the edges only, while the middle portion of the strip is not pinched. (Kocicz patents.) A third forming roll system, however, favors an arrangement by which the rolls grip only the middle portion of the strip, with the roll pressure decreasing toward the edges which are allowed to move freely.

It must be noted that there is but one periphery along the surface of the rolls, ordinarily that of the lowest point of the upper roll, whose speed equals the speed of the rolled strip. All the other roll surface peripheries will vary from the speed of the rolled stock. As a consequence slipping will occur and considerable friction develop between the rolls and the rolled strip. The further result of excessive heat sometimes developing makes it necessary to run the rolls in an oil bath.

When the cheaper kind of hot rolled strip (which for many purposes is satisfactory) is rolled by this method the highly polished surface of the rolls will not only be scratched but also frequently damaged by the roll scale that adheres to the strip and is being pressed onto the rolls. Rolls of smaller diameter might even burst under the pressure caused by a plus tolerance in the material. For this reason this forming roll system can, if at all, be employed in the roll-forming of high quality cold rolled strip only.

The second system avoids the aforementioned drawbacks in that the space between the rolls is kept wider in the center than near the edges. Lubrication thus becomes almost superfluous. However, as pressure is applied only near the edges, elongation of the strip will mainly take place in the neighborhood of the edges. This will make the material wavy, and tubes made by this method will be subject to internal stresses and can only with difficulty be kept straight though straightening rolls are employed. So this method, too, is still not satisfactory.

An essential factor remained unobserved: While the central or bottom portion of the section performs only a longitudinal movement during the roll-forming operation, the two edges of the strip, as they are brought into welding position, that is, to the sides of the welding joint, must also perform a transverse movement. The resultant movement is in the diagonal whose length is greater than the distance the bottom portion must cover.

The third system is so arranged that the distance between the rolls is smaller at the center than at the edges. Thus the strip is caught and pressed only at the center and its lowest point, the roll pressure diminishing towards the edges. The elongation thus effected by the roll pressure exerted near the bottom compensates for the elongation caused by the stretching of the edges.

The creation of internal stresses is thus almost avoided and bending and stretching of the ribbon take place fairly regularly, necessitating very little subsequent correction and fewer pairs of rolls. Together with vertical flanges on both sides of the rolls

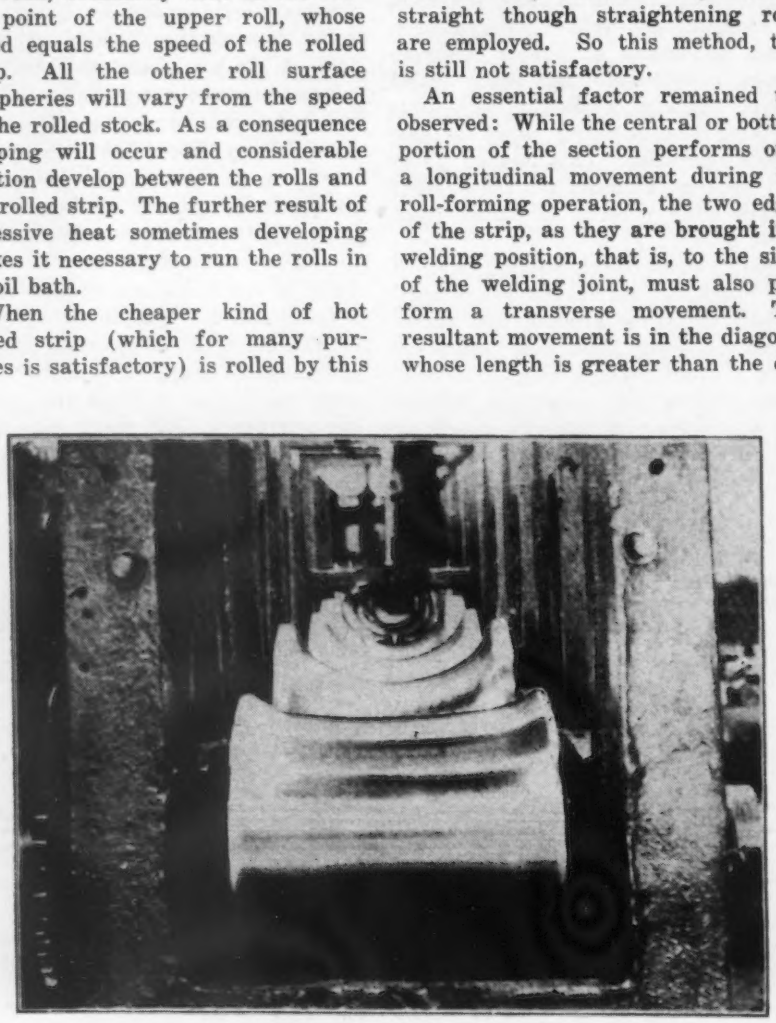

Fig. 28—Series of rolls used in shaping flat strip into cylinders.

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which prevent slipping of the strip to the sides and a narrow central vertical collar which keeps the tube joint at the correct place for welding, this forming roll system is the best suited for the forming of hot rolled strip.

When the mechanical difficulties are overcome so that a perfectly round and seamless close-joint tube can be turned out ready to be welded, attention will turn to improving the welding apparatus. That is, as far as oxyacetylene welding is concerned, the development of multiple burners. The object is to accomplish a perfectly sound weld at a very high welding speed with the lowest possible consumption of gas.

The inconspicuous one and two-flame welding heads, as they were used in this country around 1910, have thus been developed to modern 4-ft. welding torches of intricate construction that permit a welding speed of up to 400 ft. a min. for tubes with a wall thickness of 0.08 in. Upon completion of the welding operation the tube is finished by a series of straightening and sizing rolls. Large loops in the metal ribbon make it possible to weld together the ends of the strip coils without interruption, while rotating flying saws, mounted on a shuttle carriage, insure the continuity of the process. Such is the perfection of the welding torch for autogenous welded tubes that production speed has no limit but in the desire of rigid quality control.

Some time after the perfection of the autogenous welding process the electric resistance welding process for tubes was developed. Here, the problem was how to build transformers suitable to generate the type of current requisite and to make good contacts for the passage of the current. Also, to be considered was that the consumption of current was to be kept as low as possible and that the zones heated on each side of the tube joint had to be as narrow as could be done.

The first processes of electric resistance tube welding were developed in the twenties of this century (Harmatta patents and others). These processes were then rather clumsy and the input of current was so great that the whole tube turned white hot. Also, the tube was subject to heavy oxydation. The tubes thus turned out, though competitive in quality, could not compete with tubes welded in the conventional butt-welding process from the economic point of view.

Subsequent processes of electric resistance welding, using both direct and alternate currents, were more and more improved and refined. Prominent among them is the Johnston process that utilizes alternate current. The patent of 1924 covered a large field of electric resistance welding and accorded excellent protection. The process employs complicated transformers allowing a wide variation in current strength and number of phases such as it is requisite for the welding of tubes with varying wall thicknesses at different speeds arbitrarily chosen.

Circular electrodes, made of a beryllium-copped and mounted on an overhead framework, make excellent contacts on each side of the edges of the skelp. (See Fig. 31.) Adjustable pressure rolls, arranged directly underneath and on each side, enclose the tube. While the pressure of these rolls, as the tube passes between them, will bring the seam together, the current, taking the shortest road from one electrode to another, will heat the metal at the point of contact to welding temperature. In this manner an excellent weld is produced.

In theory, the attainable welding speed and the wall thickness to be welded depend only on the input of current strength and the number of phases per second. Pipes of up to ½-in. wall are welded by this method, and speeds of from 100 to 200 ft. a min. are common for tubes of lesser wall thickness. Just as in the autogenous welding process it is but the necessity of carefully controlling the quality of the product that determines the welding and so the manufacturing speed.

Just a few words may be said about the limitations and the economy of the various welding processes: As it has been stated, in the conventional butt-welding process the wall thickness cannot be chosen arbitrarily but must be greater than a given thickness. Also the maximum diameter of tubes made in this manner cannot exceed 3 in. These are definite limitations which the autogenous and electric resistance welding processes do not know. In furnace butt welding, it will be recalled, hot rolled strip or skelp with its higher tolerances, is used. Due to upsetting and scaling, as will sometimes happen in the butt-welding process, certain tolerances for the wall thickness must be allowed for. But the allowed minus tolerances can hardly be utilized, an economic advantage in favor of the processes where cold rolled strip can be used.

The amount of energy requisite for the welding of tubes varies greatly with the different processes. In the

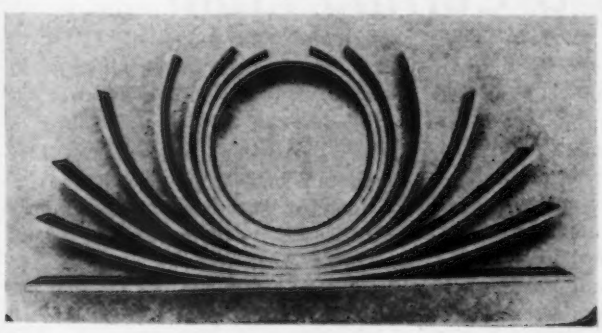

FIG. 29—Skelp in various stages of bending.

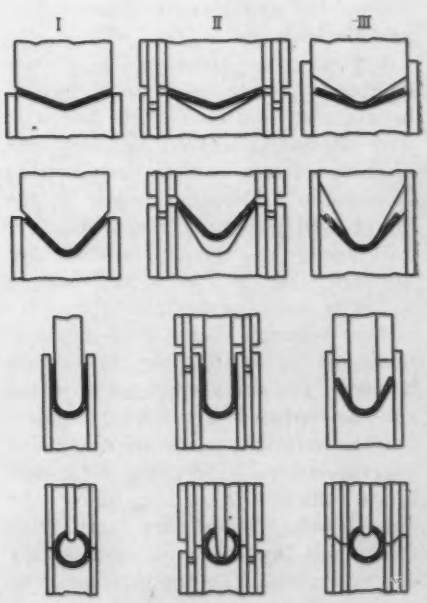

FIG. 30—Roll forming systems. In system I the forming rolls make fairly uniform contact across the surface of the strip. In the second system, the sides of the strip are gripped near the edges only while the middle portion is not pinched. In the third, the rolls grip the center of the strip with roll pressure decreasing towards the edges.

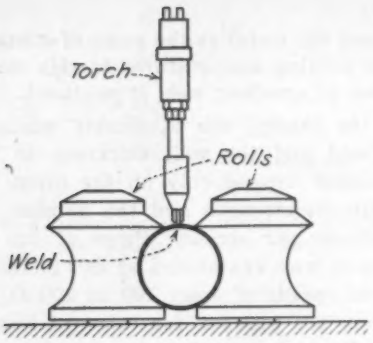

FIG. 31—Autogenous welding of tubes by means of circular electrodes made of beryllium copper and mounted on an overhead framework. Adjustable pressure rolls enclose the tube. As the tube passes through the rolls, the seam is brought together and welded.

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conventional butt-welding furnace only a small portion of the input of heat is really used for welding because, among other losses, the large furnace has to be brought up to temperature. More economical is the Fretz-Moon process where, to a certain extent, the heat is concentrated in that the flames impinge on the edges of the skelp.

The oxyacetylene torch will heat from ¼ to 1/3 of the tube surface, according to circumstances. In the highly developed electric resistance welding processes only a very small strip on each side of the tube weld is heated. For the rest, the caloric energy produced by electric current is largely far cheaper than gas generated energy.

Also the quality of the tube surface must be taken into consideration, although it may sometimes be of little importance. In the furnace welding process the whole tube is brought to white heat which entails heavy scaling and thus results in loss of material. More weight will be lost if these tubes have to be pickled.

The autogenous torch causes but slighter scaling, yet by electric welding the metal surface suffers hardly any deterioration. This is a most important factor in the making of tubes whose surface quality and close tolerances constitute an essential requirement.

Lastly, a metallurgical factor must be considered. When welding autogenously cast steel formation takes place in the welding zone and an embrittlement along the sides of the

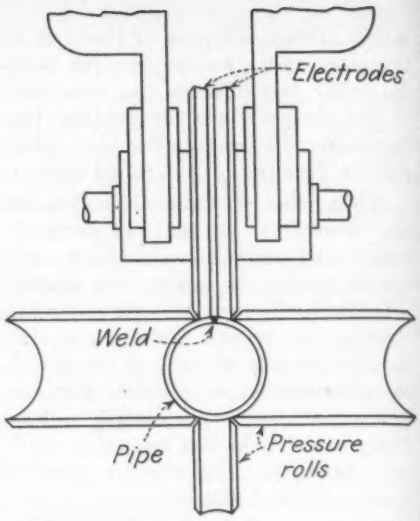

FIG. 32—Electric resistance welding of tubes.

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weld. Although these effects may be reduced by annealing and drawing, there still is in the writer's opinion a slight advantage in favor of electric resistance welded tubes.

Ed. Note: Next week concludes with a description of cold drawing and reducing operations.

Using Emulsions as a Cutting Fluid

COOLING agents, particularly emulsions, used in machining operations have two actions, cooling and lubrication, which are very difficult to determine as they cannot be treated independently, H. Stäger and H. Künzler report in *Schweizer Archiv für angewandte Wissenschaft und Tecknik.*

For a given cross-section of machining cut the temperature difference between dry and cooled cuts decreases with decreasing cutting temperatures or rate of cut. With low cutting speeds the lubricating power of the liquid used is mainly responsible for the quality of surface produced, but at high cutting speeds the cooling action is more important.

The wetting power of a liquid is increased by decreasing its surface tension. The surface tension of water can be reduced by adding sodium laurate solution; such solutions are "surface-active" and they have different efficiencies which follow the Traube law. While pure fatty acids follow this law, soaps do not exactly conform to it. The surface activity of soap first increases with higher members of the homologous series, and then falls off; higher temperatures cause the maximum capillary activity to shift to the higher homologues. The inclination of the surface tension-temperature curve will approach the horizontal the more concentrated the solution and the higher the soap in the homologous series.

Attempts have been made to obtain stable emulsions of mineral oils and water by using suitable emulsifiers. The action of the emulsifier depends on the ease with which the emulsion is formed, the stability of the emulsion, and the fineness and the stability are the most desirable properties.

The corrosion of metals during machining with an emulsion as cooling agent is a complicated phenomenon because the corrosive agent consists of at least two phases and the interfaces in its system may act like diaphragms. To prevent rusting, attention must be paid not only to the composition of the emulsion but also its action. The concentration of an emulsion must be adjusted to the quality of the surface to be obtained if the necessary protection against corrosion is to be given.

In a liquid-liquid system, the interfacial tension which governs the formation and stability of the emulsion decreases with temperatures. Emulsions therefore, should never be prepared below—10 deg. F. or above 40 deg. F.; the method of blowing in steam should not be used.

Suitable emulsions have been developed that are satisfactory substitutes for fatty free-cutting oils and for mixtures of mineral oils with electrically treated mineral and fatty oils. These emulsions are such good lubricants that an excellent surface can be obtained when milling threads on chromium-nickel steel. Emulsions have also been used in place of rape oil used in stamping gear teeth; the quality of the surface is even improved and the consumption of the emulsion is much less than that of rape oil. It is suggested that suitable emulsions could also be used to replace soaps and fatty oils for wire drawing.

Extending Gage Life By Stelliting

By STANLEY H. BRAMS
Detroit Editor, The Iron Age

. . . Interest in surfacing of gage parts with welded-on Stellite has been revived in recent years through successful efforts to overcome blowholes or porosity. Some phenomenal increases in life have been obtained on thread gages with Stellited wear surfaces.

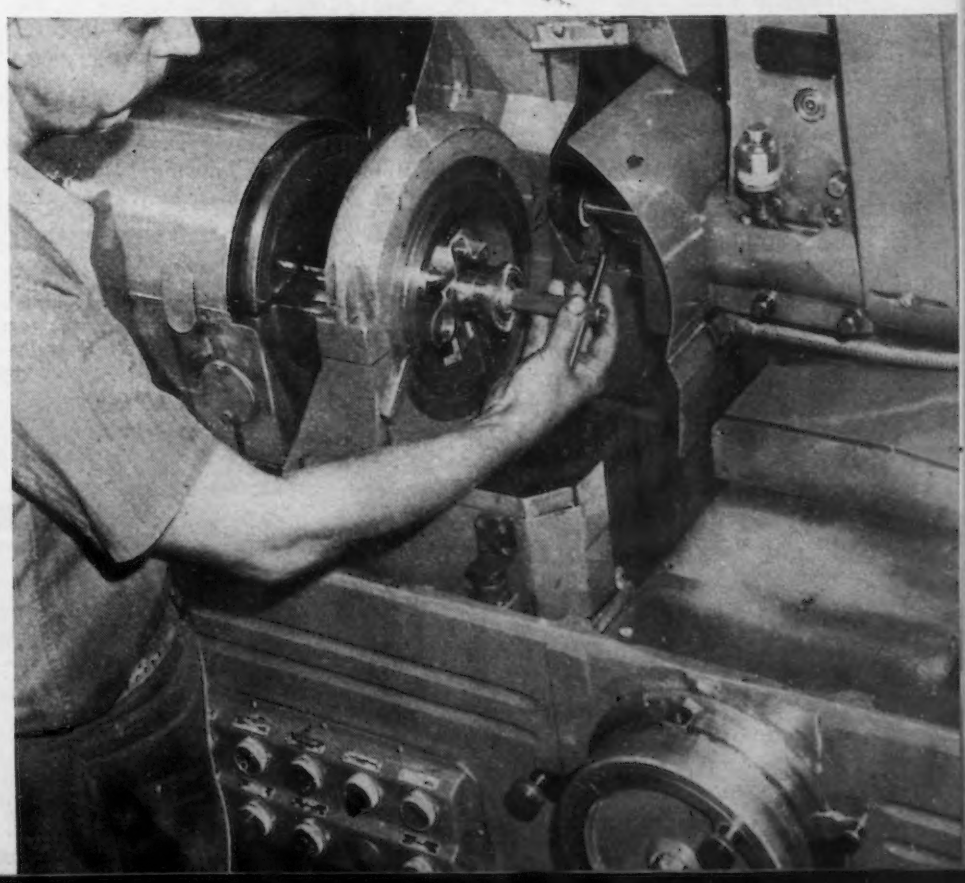
THE use of Stellite alloy for hard surfacing the wear surfaces of gages is giving them a significant new lease on life. For about 20 years this chromium-cobalt material has been used for gages either in the form of cast solid or hollow plugs, small pieces brazed on to gage jaws, or welded-on surfaces. A Detroit firm, the Stelway Products Co., appears to have perfected the welding-on technique and is steadily expanding its clientele, with uniformly satisfactory results reported.

Stellite gages resist wear considerably better than high speed steel and at the same time are less brittle than carbide, thereby offering attributes which are sought for inspection tools, particular in thread gages. Rockwell hardness of the welded-on surfaces is specified by Haynes Stellite Co., the manufacturer of the welding rod, at 40 to 54 on the C scale, depending on the grade of alloy; most of the gage applications are made with C-54 material. This grade possesses an average ultimate tensile strength of 47,000 lb. per sq. in. and compressive strength of 256,000 lb. per sq. in. The softer grades show a higher tensile strength, up to 105,000 lb. per sq. in.

Important in so far as gages are concerned is the thermal linear expansion coefficient. For the hard grade this runs 0.0000080 in. per deg. between 32 and 1800 deg. F. That of carbon steel is 0.0000060 in. The close relationship between these coefficients makes Stellite gages practical for checking work done in different shops under different temperature conditions.

Acid and corrosion proof, Stellite alloy is possessed of a dense structure and takes a high finish which lends lubrication qualities to gages made of the material or surfaced with it, somewhat like hard chromium finishes. One maker using a very complicated gage for checking a gun barrel reported that steel gages had a tendency to freeze in the barrel after a relatively low number of applications. In each case, this necessitated scrapping both the gage and the material to which it had frozen, running the loss into many hundreds of dollars. Since a changeover to Stellite surface gages was made, no instance of this sort has been reported.

STELLITE thread gage being applied to receiver body of 20-mm. automatic cannon in an Oldsmobile plant. Production of this weapon requires scores of inspections for accuracy. In this setup the receiver body is being internally thread ground.



FOLLOWING machining operations, 20-mm. automatic airplane cannon receiver body is given additional inspections. Here Stellite thread gage is being applied by inspector in the gun plants of Oldsmobile at Lansing, Michigan.

Stelway Products works on the sensible philosophy that Stellite alloy is not necessarily a universal, foolproof cure-all for increasing gage life. Account is taken of the type of material used in the part, its hardness and the type of heat treatment used, and the condition of the machined surface. Manufacturing then embodies the most suitable type of Stellite alloy and the correct method of application. This procedure is followed in the furnishing of either finished gages to the manufacturer or gage blanks to the gage company.

Absence of Porosity

Stelway has drawn attention because of its development of a means of welding a bead of Stellite rod onto steel surfaces with a practical absence of blowholes or porosity. Application to the steel core is accomplished either by acetylene welding a layer of the material to the outside or by making a bushing of Stellite alloy, then press-setting it on the core. There appears no practical limit to the size of gage which can thus be made. This company has also developed quick and satisfactory methods of grinding the coatings so laid. When furnishing gages to gage shops, Stelway assembles, centers, rough grinds and faces gage members within 0.005 in. of finished size; the gage shops then finish grind and lap.

Thread gages appear particularly suited for Stellite alloy. After a fairly heavy bead is laid on such blanks, threads can be ground on which all wearing surfaces consist of the alloy. On ordinary plug gages, the Stellite layer forming the gaging surface, after lapping, runs between 1/32 and 1/64 in.

Initial costs are quite definitely higher than those of ordinary gages. They will run from a third more up to two or three times as much. But at the same time wear tests indicate that effective life of gages is prolonged from 5 to 10 times and from 18 to 25 times on thread gages; multiples of such ratios are not uncommon.

The Olds Motor Div. of General Motors Corp., Lansing, Mich., has been one of the most active investigators into the use of Stellite alloy for gage surfaces. Experiments began with various materials early during the conversion period, the objective being to prolong gage life. Among the materials tried were glass, cemented tungsten carbide, sintered boron carbide and Stellite alloy. Some materials were satisfactory for certain applications and some were not.

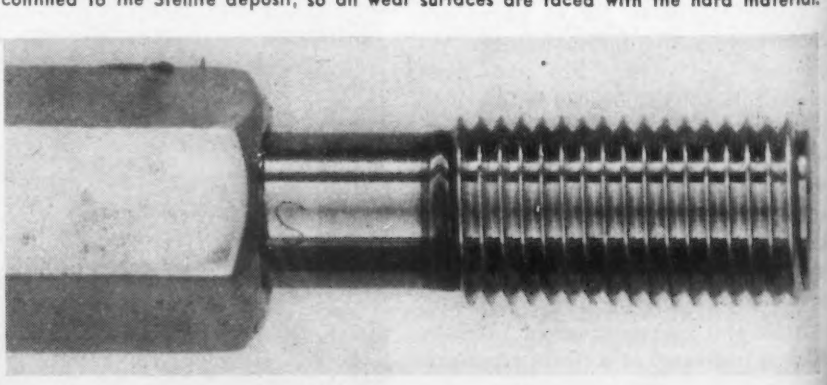
Thread Gage Applications

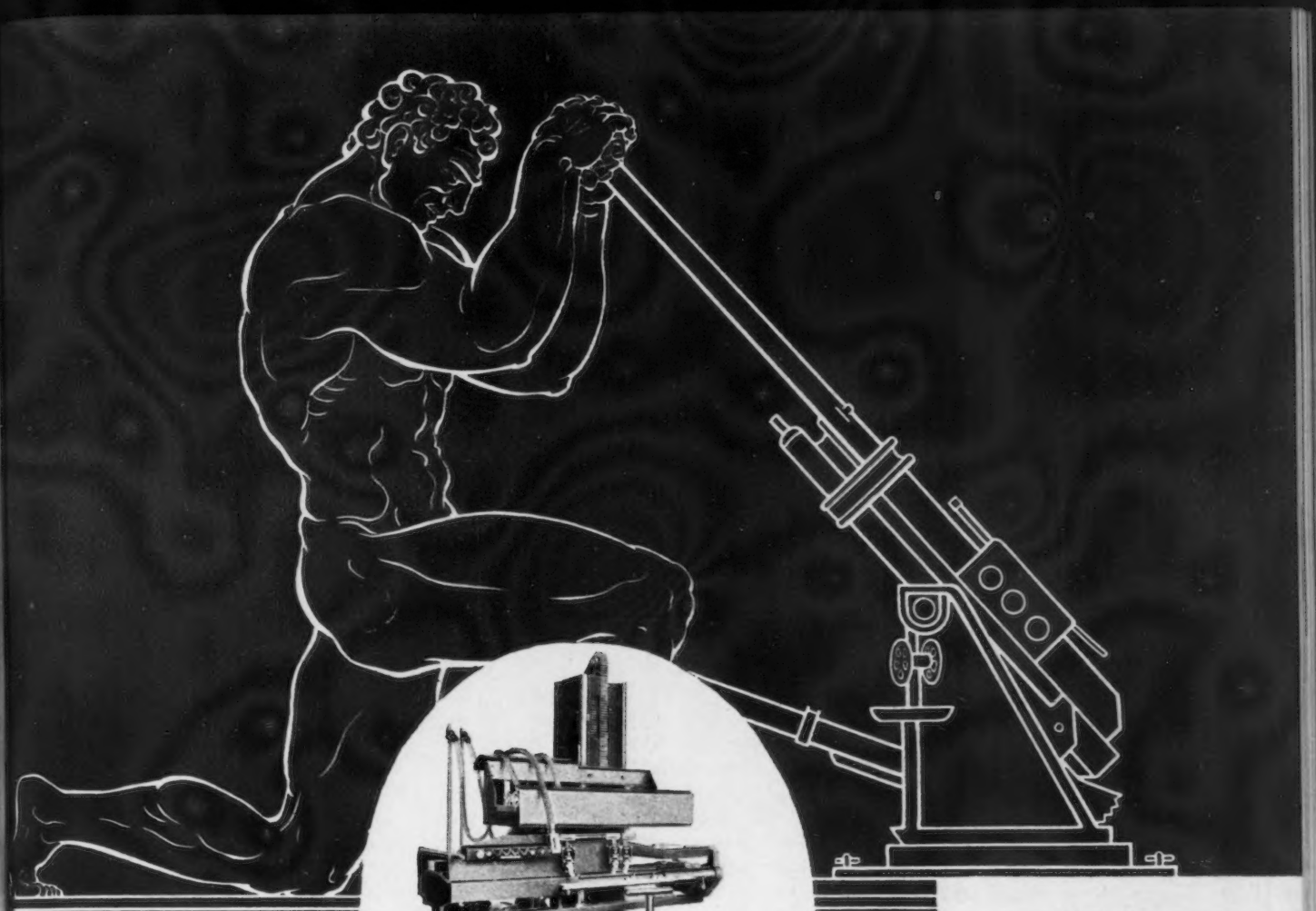
For thread gages, a number of specific problems were involved. This type of gage had to be made accurately. Only a few ten-thousandths of an inch for wear on pitch diameter could be allowed, thus limiting gage life. Material had to be hard, yet shock resistant; if made of brittle material the threads chipped easily in handling. In answer to these critical qualifications, Oldsmobile found that Stellite alloy made excellent thread plug gages.

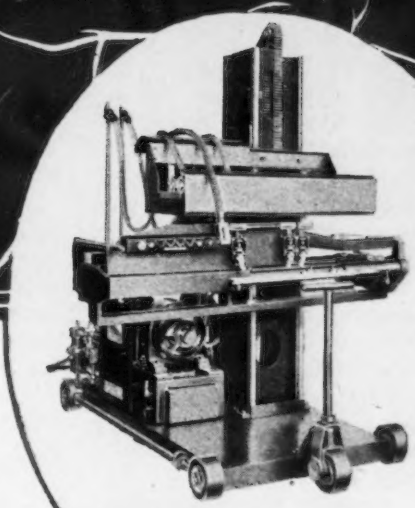
Olds found, too, that where production volume warranted the higher costs of Stellite gages, their value was enhanced by their lower vulnerability to breakage during handling by new, inexperienced operators.

One application at this plant proved very interesting. A metric internal thread, ground in a war goods part, had to undergo checking for size and also had to be qualified for correct location in respect to the front face. During the grinding operation, the wheel left small particles of emery dust imbedded in the steel part. This emery dust could not be cleaned out by wire brushing or washing. When a thread plug gage was inserted in the hole, the emery acted as a lapping agent and wore it very rapidly. Ordinary tool steel gages lasted approximately 350 applications. Gages were then made with Stellite alloy and were used in 11,100 applications before being withdrawn from service, an increase in life of over 30 times that of steel.

STELLITE thread gages, one of which is shown above, have been found by Chrysler Corp. to outwear ordinary steel gages by a wide margin. Customary procedure is to lay a heavy bead of Stellite onto the gage body. Grinding of the thread is then confined to the Stellite deposit, so all wear surfaces are faced with the hard material.







Oilgear furnishes thousands of pounds of pressure to force gun barrels back against recoil, also the rapid reciprocation which enables gun to return to "battery" as in actual firing.

*Latest Model Exercise Machine**

Guns get a move-on when Oilgear powers the push

A Gymnasticator, as you might guess, is an exercise machine. But this time it's for the recoil mechanisms of guns—these too have to be tested before they can be trusted. The job of exercising the recoil was formerly done by hand. It took hours and was inadequate. Now it's done with Gymnasticators—under conditions that actually and accurately simulate rapid fire—and the job takes *minutes*.

This too is another success story for Oilgear . . . the Fluid Power system that provides, among other things as in the case of Gymnasticators, tremendous power in small space, with rapid reciprocation. Possibly you need just this . . . *or* steplessly variable speed control . . . *or* hairline accuracy in control of movement . . . *or* force without motion . . . *or* any of a dozen other highly interesting functions for designers of post-war machines. The combination of experience and function which Oilgear engineers and Oilgear systems can bring to you may provide the right happy ending to your story too. Now is the time to find out . . . THE OILGEAR COMPANY, 1303 W. Bruce St., Milwaukee 4, Wisconsin.

*Mfrd. by Jackson Hydraulic Machine Co., Inc., Rockford, Ill.

ARE YOU TRYING TO:

1. Apply large forces through long . . . or short . . . strokes at variable speeds?
2. Obtain automatic work cycles, variable speeds in either direction . . . with or without pre-set time dwell?
3. Apply large forces through continuous or intermittent reciprocating cycles at constant or variable velocities?
4. Obtain extremely accurate control of either position or speed of a reciprocating member?
5. Apply accurately variable pressure either static or in motion?
6. Closely synchronize various motions, operations or functions?
7. Apply light . . . or heavy . . . forces at extremely high velocities through either long or short distances of travel?
8. Obtain continuous automatic reversing drives at constant R P M or over a wide range of speed variation?
9. Obtain accurate remote control of speed and direction of rotation, rates of acceleration and/or deceleration?
10. Obtain constant horsepower output through all or part of a speed-range?
11. Obtain automatic torque control?
12. Obtain accurately matched speed of various rotating elements?
13. Obtain constant speed output from a variable speed input?
14. Obtain full pre-set automatic control, elimination of problems of shock, vibration, etc.?

You Need Oilgear!

OILGEAR

Fluid Power

Assembly Line . . . STANLEY H. BRAMS

• Manpower for operation of Detroit plants will be available for any civilian output when European war ends . . . Employment total already may be at peak . . . Auto Council proposes steps on reconversion planning.

DETROIT—Proceeding with the general discussion of reconversion, it becomes apparent that three conditions must be met before any physical changeover can be accomplished in any plant. The armament production of the specific manufacturer must be no longer imperative. He must have space in which to reconvert without impairing what segment of war production must continue. Finally, he must have manpower.

Manpower becomes the immediate subject of discussion. In the light of fears from Detroit area plants that they may actually be losing military business today unless they establish quickly that they can scratch up hitherto undeveloped worker resources, it is on the surface difficult to see how men could be spared, even in the event of partial reconversion, for civilian production.

However, in the first place, it is a growing belief in Detroit that manpower requirements stand today at peak in the auto city, or even past peak, in contrast to the belief held a few months ago and still held in some quarters, that as many as 90,000 additional workers may be necessary.

The reason for this gradual change in anticipation is that cancellations continue to accumulate on war contracts, even though the European war is still in full swing. Until last week these cancellations were all in the ordnance field; the Buick layoffs indicate an extension of the development into the aircraft sphere.

As has been pointed out, an end to the European war will mean a virtual windup on most ground requirements, which account today for nearly 50 per cent of Detroit's total war production. If the reasonable assumption is made that today about 800,000 men and women are working in war plants in Detroit area, this proportion would point to an availability of somewhere above 300,000 of these workers when hostiliites cease in Europe. Conceivably the total will be higher. Certainly the manpower question mark will be answered in Detroit, and the echo of the reply will be heard in the other centers feeding the passenger car plants in normal times.

Indicative of the possibility that Detroit may have reached its war production employment peak is the fact that one of the largest employers in the area has actually experienced a net reduction in hourly payrolls during the past two months. Inasmuch as this producer turns out one of the most widely diversified arms requirements lines in Detroit, the net payroll reduction must be considered significant.

As corollary evidence, the numbers of machine tools still to come into the Detroit metropolitan area are shrinking steadily and now stand close to bedrock. Needless to say, this foreshadows that the number of men needed to turn out military reqiurements—and this particularly applies to aircraft engine components—is being rapidly stabilized. In fact, it is fair to assume that as programs mature toward maximum volume, the numbers of men required to activate them will actually diminish, due to the enlarged experience of the factory managers and superintendents.

Manpower probably exists in the Detroit area already to undertake what tool and die programs will be necessary for a partial reconversion. The very fact that jigs and fixtures, gages, cutting-tools and other such needs can be generally had within a month of ordering is apt indication of the increasingly slack situation in the tool and die shops. Sheet metal dies also can be had within a month at mosts hops, and within two months at practically all shops.

NONE of this is intended to infer that any reconversion can be successfully accomplished before, at the earliest, the end of the European war. Although contracts are being cancelled right and left by the Army today, the general feeling seems to be that facilities thereby made available should be held in standby readiness. After all, unexpected as this might be, a sharp reversal on the Russian front and even more dogged resistance in Italy, coupled with bitter battling on whatever beaches may be chosen for the Allies for additional landings, might all combine to necessitate a hurried recall of manufacturing earmarked for figurative mothballs.

In connection with the broad subject of reconversion, the Automotive Council for War Production unveiled a new movie, "Jobs After Victory," which will spearhead its program to impress upon Congress and other interested agencies the necessity for considering the reconversion problem realistically right now.

Stating that the government is "already behind" in a reconversion schedule—thereby indicating anew the general optimism of Detroit in regard to the war program—George Romney, managing director of the Council, set up a four point program for immediate action:

First, he urged that the government establish a national policy for disposition of government owned tools and facilities. The first step in any such program, he said, would be for the services to determine which tools they need for permanent arsenals and other purposes. The government then could make other tools available for sale to companies which could put them to productive use when their war work is done. Presumably the companies would earmark the tools they want now and pay for them on delivery.

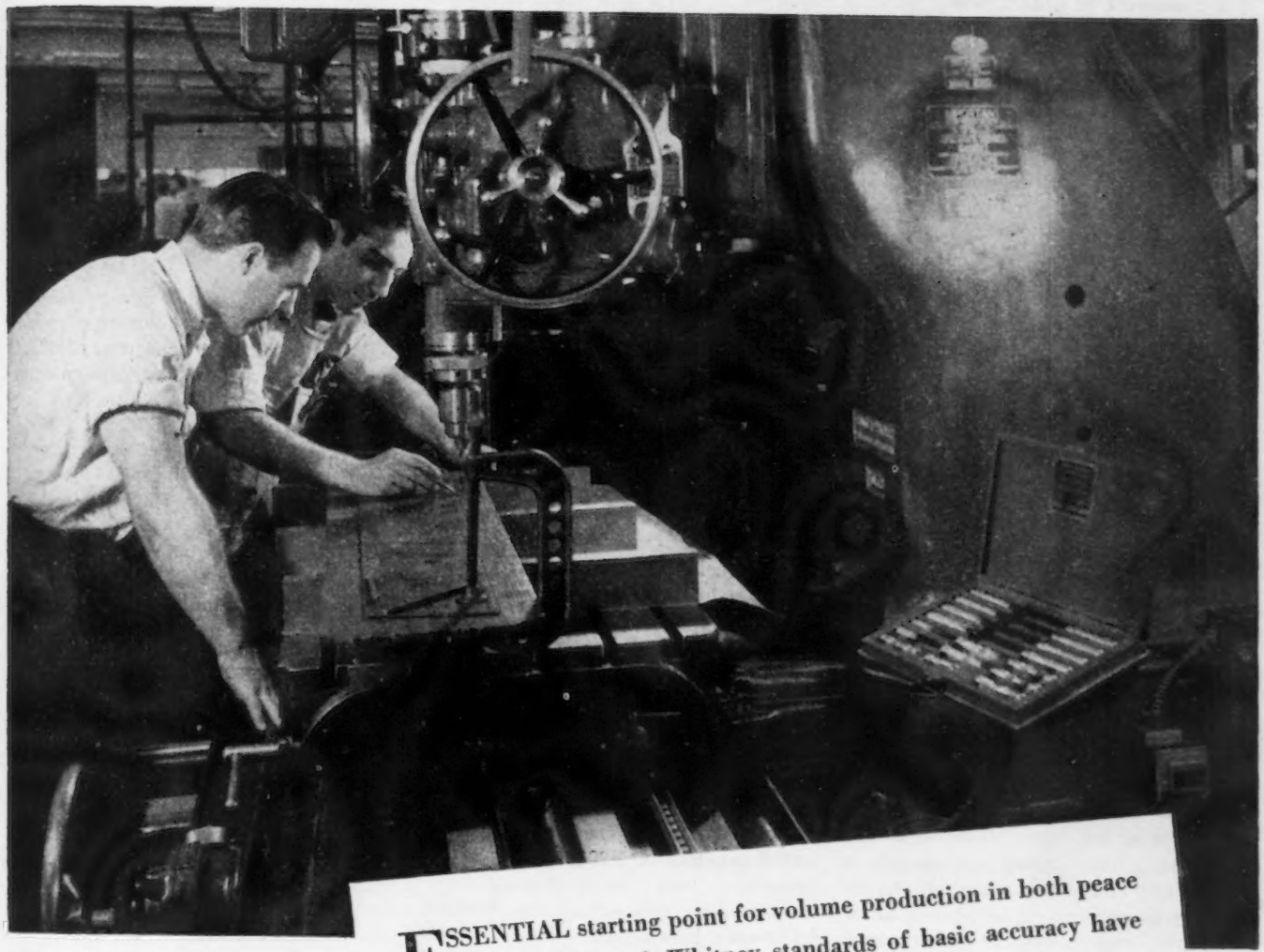
Rate of payments, Mr. Romney indicated, would have to be determined in Washington by some sort of set formula. Discussion heard on this score has been that the price should be at the 1937 level less 1 per cent a month for depreciation starting at the date the tools went into use. The adoption of the 1937 level is talked of as a means of eliminating penalty which would be levied on companies making such purchases by reason of the overtime work which generally went into war tools.

Such procedure, it was pointed out, would facilitate prompt clearance of plants after the war or at any time reconversion was permitted.

The second point of recommendation was that industry should be allowed to place orders now for pro-

THROUGH ALL THE RUSH

Unchanging Standards "Hold the Line"



Pratt & Whitney Jig Borer at work . . . laying the basic ground work for accurate mass production. In war and in peace, these precision machines perform invaluable service . . . produce the jigs and fixtures from which countless other machines and products stem. They also serve as "jig eliminators" on short production runs. Write for details.

ESSENTIAL starting point for volume production in both peace and war, Pratt & Whitney standards of basic accuracy have "held the line"—unchanged, uncompromised.

Despite war pressure for speeded output, P&W standards have not relaxed one iota. There's too much at stake—too many war assembly lines dependent for their speed upon the underlying basic accuracy of machine tools, cutting tools and gages that stem from P&W.

As builders of machines that make machines, P&W will continue to "hold the line" until Victory is won — and then to keep on holding it in the years of world rebuilding that will follow.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

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duction equipment which will be needed on civilian requirements. Presumably what was meant by the Council in this regard was not alone a placement of orders, which already has been done in fairly substantial volume, but also a permission to the machine tool builders to start actual manufacturing on such orders. Naturally, war tools would hold a preferred position on machine tool books above any peacetime requirements. The auto industry is represented as needing at least 6000 machine tools which have been shipped out of reach of its plants, to Russia, England, and other war industries throughout the nation. The development of a program like this would speed the reassembling of peacetime facilities in the auto plants.

THE third phase of the program calls for allotment of a small but necessary amount of war materials for experimental work in connection with peacetime products. In all likelihood, this would be a fairly minor matter. Even though many substitute materials and such expedients as national emergency steels has been adopted by industry, it would be a fairly simple matter to translate the manufacturing experience already gained into a bank of knowledge as to how these substitutes would perform in motor cars.

Finally, the Council recommends, a firm and consistent policy should be set up by government which will allow the auto men to proceed at their own speed without waiting for detailed audits and inspections of materials in all these varied stages of manufacture.

Mr. Romney recommended a single audit, inspection and settlement of war contracts, one which would be final. Reopening would be permitted only when fraud or misrepresentation was involved. Thus there would be no untoward delays in evaluating material on hand and in fabrication.

This is really a most important part of any program, quite obviously. Most contracts on war work call for payment at cost, sometimes with a reasonable profit margin, for partly completed items at any cancellation date. It is apparent that if cost sheets must be scrutinized by auditors in detail to determine the investment in thousands upon thousands of incomplete pieces, while at the same time the pieces stand by on the production floors awaiting inspection and confirmation, reconversion could be delayed a matter of years. Some sort of flat settlement is called for by industry, and this appears to be about the only practical way of arriving at a determination. Perhaps some proportion of units in a plant in incomplete stages, balanced against a quantity of completed assemblies, and then weighted against the cost of the completed assemblies, might be utilized to effect a rough evaluation of work in process. Inventories of semi-completed goods are not high in most cases, and this might be a means of getting at the problem most simply.

The stake in speedy reconversion, as sought by the Automotive Council and other industrial groups, is much larger than the welfare of the particular industries involved. After all, the national savings are counted on to start up a buying wave when peacetime production arrives. If reconversion is delayed, bringing with it considerable unemployment for any noticeable period of time, those savings will be dissipated, the impetus for a post-war boom will fizzle out, and the future will again be dubious.

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Carnegie-Illinois Starts Second E-T Blast Furnace

Pittsburgh

• • • **The second of two** new blast furnaces installed at the Edgar Thomson works of Carnegie-Illinois Steel Corp., Braddock, Pa., was blown in last week. Part of the government's Defense Plant Corp. expansion at this U. S. Steel subsidiary plant, the new pig iron producer, designated as "B" furnace, will add 1330 tons daily to the production of its twin, "C" furnace, which went into production July 19.

▪

Algoma Steel Corp. Ltd., Sault Ste. Marie, blew in its new No. 5 blast furnace at the beginning of the month. This stack, the largest in Canada with rated capacity of 1,200 tons on a 24-hour basis, was completed about three months ago. This brings the number of stacks in blast in Canada to 11 with three down.

Buying Intentions of U. S. Families Analyzed by C. of C.

• • • **Buying** which consumers currently intend to do within six months after the war ends is analyzed by the Chamber of Commerce of the United States in its third progress report of a consumer survey. Findings include:

Around 3,675,000 families intend to buy new cars; 1,540,000 families intend to buy or build a new home; 39 per cent of the home owners plan to make improvements or repairs; 2,625,000 families intend to buy mechanical refrigerators; 2,100,000 families intend to buy washing machines; 1,645,000 families intend to buy stoves; 1,400,000 families intend to buy vacuum cleaners; 2,555,000 families intend to buy radios; 840,000 families intend to buy sewing machines; 1,505,000 families intend to buy electric irons; 1,085,000 families intend to buy electric kitchen mixers.

Byrd Group to Probe Huge Unspent Sums

• • • **Around** $100,000,000,000 in uncommitted balances now held by the War and Navy Departments, the Maritime Commission and the War Shipping Administration will be investigated to see if the amount cannot be returned to the United States Treasury, the joint Congressional Economy Committee promised this week.

The committee, headed by Senator Harry H. Byrd, Democrat of Virginia, in a "progress report" warned that a still greater job lies ahead.

Unexpended balances of the four war agencies totaled $186,785,383,797 last September, the report stated. Of this amount, $92,000,000,000 had not been abligated.

The committee will urge an investigation of these huge unobligated balances by the Appropriations Committee to determine whether additional appropriations will be needed.

M. N. Landay Co. Purchases Washington Tin Plate Co. Mill

Pittsburgh

• • • **M. N. Landay Co.**, here, has acquired, for an undisclosed consideration, mill property of the Washington Tin Plate Co., Washington, Pa.

COMING EVENTS

Jan. 10 to 14, 1944—Society of Automotive Engineers, Detroit.
March 14, 15—National Association of Waste Materials, Inc., New York.
April 2 to 5—The American Ceramic Society, Inc., Pittsburgh.
April 12 to 15—The Electrochemical Society, Inc., Milwaukee.

RIGHT FROM THE PAGES OF THIS TOOL STEEL MANUAL

You can find ways to . . .
INCREASE PLANT OUTPUT
REDUCE COSTLY MACHINE SHUT-DOWNS
SIMPLIFY HEAT TREATING

IDLE machines and presses—waiting for tools that must be repaired, reground or replaced—*can* be kept working more hours per month. And the Carpenter *Matched Tool Steel Manual* can help you keep them on the job to increase output where it is needed.

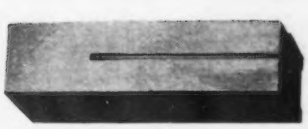
In thousands of plants, this Manual is helping to eliminate costly machine shut-downs. And its simplified heat treating instructions protect the many valuable hours that go into the making of tools.

The Carpenter *Matched Set Method* of selecting tool steel is not "just a fancy name". Ask any Tool Room Foreman who has used it . . . and note the *typical* results shown here.

It's easy to cash in on the advantages of the *Matched Set Method.* Just drop us a note on your company letterhead and we'll start your copy of the Carpenter *Matched Tool Steel Manual* on its way. And, of course, when you need personal help with a special tool steel problem, your nearby Carpenter representative will be glad to put his diversified experience to work for you.

These Two Plants Used the Matched Set Method ... and look at the Results they Got!

1



The Tool: A striking die for stamping gold-filled spectacle temples.

The Problem: When made from a straight carbon tool steel, the die would break after about 14,000 pieces.

The Solution: The Tool Engineer saw that *greater toughness* was needed, so he checked the *Matched Set Diagram* and found that *Solar* would probably give best results.

With *Solar,* output per tool jumped from 14,000 to 100,000 pieces!

2

The Tool: A draw die for drawing bearing retainers from plain hot rolled steel ⅛" thick.

The Problem: After about 4,000 pieces, the die had to be replaced because of oversize wear. Replacing the worn die consumed 1 hour, during which the press was idle.

The Solution: Going to the top of the *Matched Set Diagram* for *greater wear resistance,* they selected *K-W* tool steel and got these results:

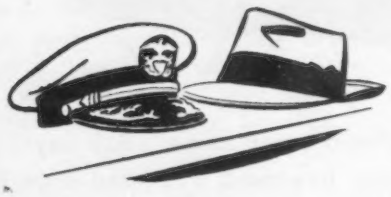
1. Tool life increased from 4,000 to 86,000 pieces.
2. Press shut-down time was reduced by 42 hours a month, which meant 52,500 pieces *extra output* per month.

THE CARPENTER STEEL COMPANY
121 W. Bern Street, Reading, Pa.

Carpenter
MATCHED
TOOL STEELS

Washington . . . L. W. MOFFETT

• If Government reforms are carried out; if industry faces future with optimism; if labor problem can be settled; along with more ifs, 1944 should be a more stable year than any since war started.



WASHINGTON—There is little debate over the statement that the major problems to be faced by American business before reconversion to peacetime production can be carried out are contract cancellations, renegotiation and taxes. However, as business turns the corner to face an uncertain New Year several smaller problems will be felt for the first time in 1944.

The effect of most of these problems will be felt long before hostilities actually are terminated, since they are direct outcroppings of contract terminations and production cutbacks, accompanied by the resultant trend toward increased civilian output.

The first of these minor difficulties will tax OPA's power to hold-the-line in prices. OPA officials recently began work on what may be one of their biggest problems, the pricing of increased supplies of consumers' goods, which will be produced before the war's end, due to production shifts.

OPA spokesmen say they expect to be faced with this problem for the first time in the first quarter of 1944, due to WPB's plans for mid-war conversion. The flow of civilian goods will be just a trickle in the first quarter, as compared with normal output. It will increase steadily, as will this pricing problem, until the flood stage is reached after Germany is knocked out of the war. OPA will undoubtedly pass out of existence shortly after the allied victory is complete, but until that time the road ahead looks rocky for the price agency.

The bars on civilian production are being let down slowly. Production costs are high at present and show no signs of dropping. In fact, increases in many fields appear imminent. There is no better example than steel. Price increases in steel are inevitable if Phil Murray's demands are even partially granted. Since only small plant capacity will be released for civilian production for at least another six months production costs would normally be expected to rise. It is quite obvious that a plant operating at only 30 or 40 per cent of its capacity would not be able to operate as economically as one that is running at full capacity.

In releasing capacity for civilian production WPB very likely will be the "Santa Claus" and no doubt the task is not begrudged by anyone. However, it probably will be seized upon by the "bunglecrats," who for years have been carrying out the New Deal's give away policies.

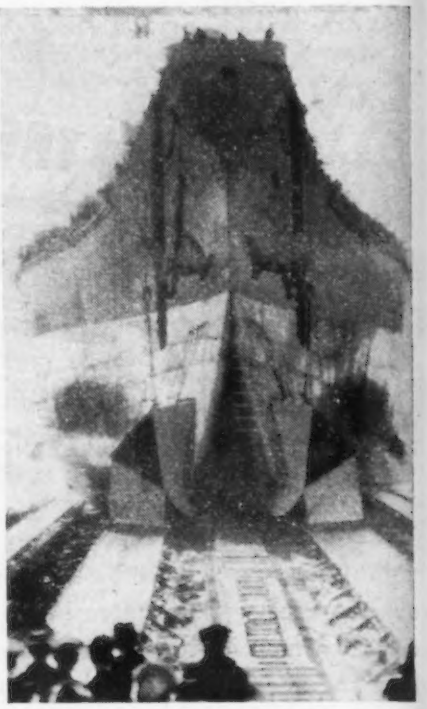
Other factors which will tend to boost production costs of civilian goods in the conversion period will be the reluctance if not a stubborn refusal of labor to give up the 48-hr. week and to stop producing war goods. Walkouts because of production cutbacks are just beginning to rear their ugly heads on the labor front. Many Washington observers believe that the new wage demands in the steel industry are a direct effort to cushion the return to the 40-hr. week, particularly if it comes before the war is over.

OPA officials say that plans for holding down prices in the conversion period are not complete, but they believe that they will be able to cope with the problem. This is rather an optimistic view if recent Congressional actions, which dealt stabilization officials a resounding slap, are taken into consideration.

IT is believed in OPA that the first major problem will arise in consumer durable goods production and that conversion pricing will then come up in the soft goods lines and food.

Whether OPA attempts it or some other agency tackles this job it will be just as vital to hold the lid on prices in the conversion period as it is during wartime if the United States is to avoid runaway inflation.

Further evidence that this pricing problem will be encountered in the first quarter of 1944 and in subsequent quarters is the announcement of the OCR Class B product list for the first quarter. The list now contains 85 civilian items, whereas for the final quarter of this year only 46 categories were listed. This reflects WPB's increasingly optimistic attitude on civilian production. Likewise, it is to be hoped, it means a passing of the silly sadistic philosophy of scarcity that has fallen short of its intent to make the people "war conscious." The country at large is just as war conscious as Washington. Probably more.



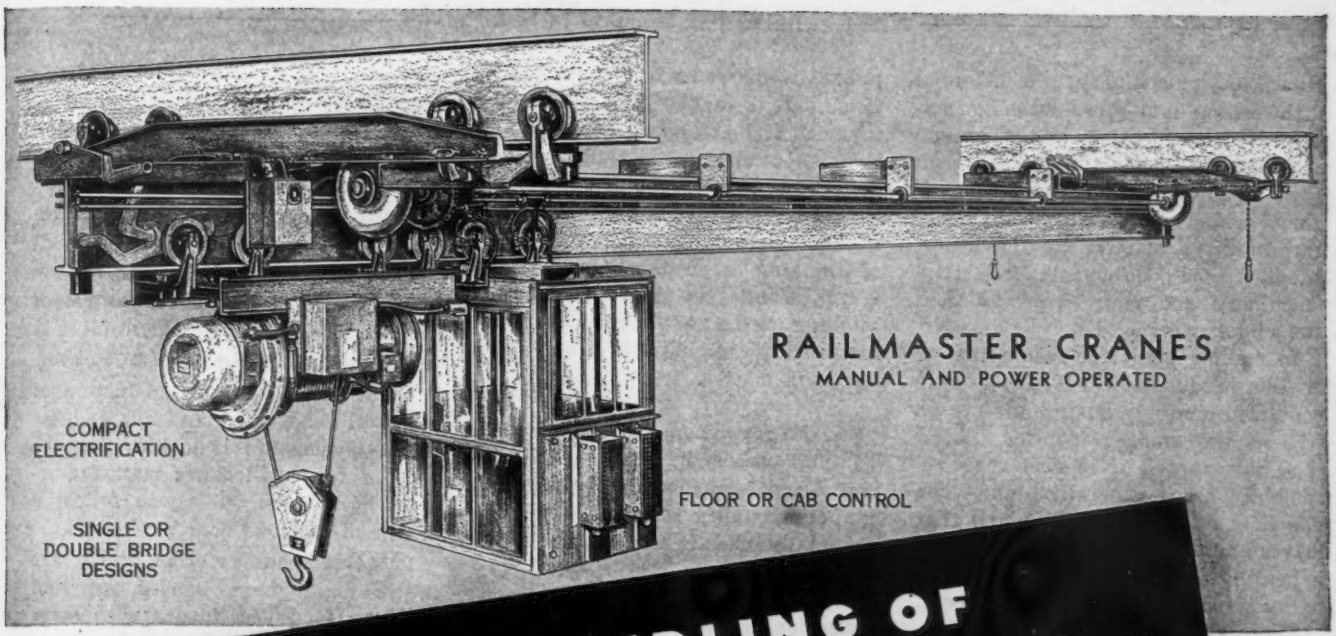
Press Assoc. Photo

WISCONSIN LAUNCHED: *The Navy's $90 million super-battleship Wisconsin shown being launched Dec. 7 at the Philadelphia Navy Yard. Its bow towers higher than a five story building.*

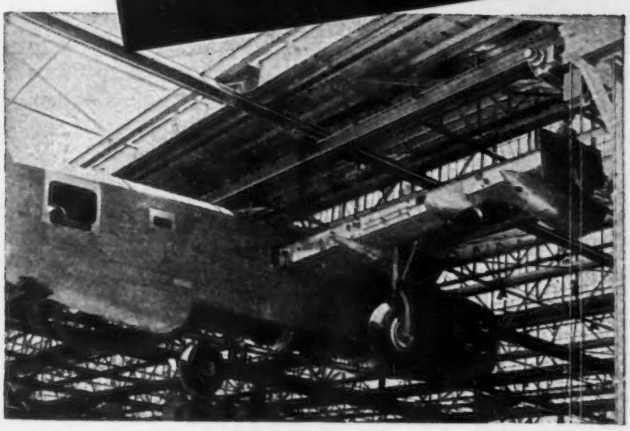
This OCR list covers only the civilian interest in the items listed. It is not a complete list of all the products in which OCR holds an interest, nor is it a fixed list. Revisions and additions may be made in any future quarter. Materials for these products have already been allotted.

For example, wire screen cloth was the only item on the list in the building materials category for the fourth quarter. For the first quarter the following items have been added: Fuses, under 2300 volts; electric wiring devices and supplies (not automotive); fabricated wire products and sheet metal and non-metallic mineral building materials.

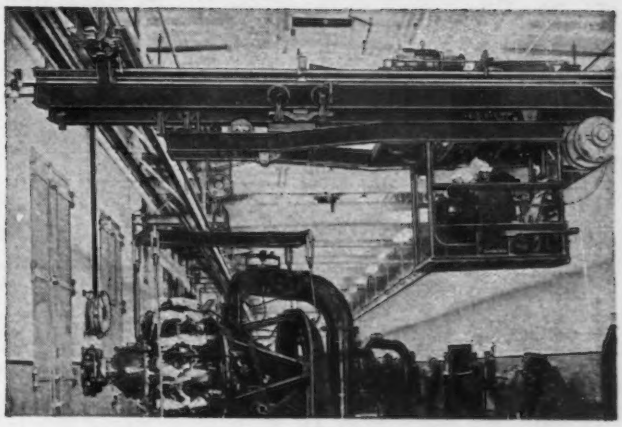
Other important items which have been added to this civilian list include sewer cleaning and sewage



FLEXIBLE HANDLING OF *Massive Production*



B-28 Bomber Makes Maiden Flight on RailMaster Crane.



Spotting motors with telescoping crane.

MASSIVE loads set up no problem when American MonoRail RailMaster Cranes are on the job. They are not limited to bridging a single span but, with their special interlocking and twin bridge designs, they can cover any area with any type of handling equipment.

American MonoRail Systems, too, are adaptable to many handling problems, offering versatile application without lengthy engineering or costly adjustment. Let an American MonoRail Engineer explain the advantages of overhead handling without any obligation to you.

THE AMERICAN MONORAIL CO.

Athens Avenue — Cleveland 7, Ohio

★ SEND FOR BULLETIN C-1. A 56 PAGE BOOK SHOWING SUCCESSFUL APPLICATIONS OF AMERICAN MONORAIL SYSTEMS.

treatment machinery; commercial dishwashing and glass washing machinery; commercial and domestic cooking and electric appliances, all types of plumbing and heating equipment; radio and radar equipment; certain types of surgical and dental supplies and equipment; industrial machinery and many types of consumer durable goods.

In making plans for resumption of civilian production WPB officials have contacted many industry groups as well as Government agencies. What they have turned up in some cases resembles what is generally found when one lifts up a mossy stone and that leaves a creepy feeling. In other cases a healthy attitude was found on the part of both business and government.

There are two attitudes in some industry circles which need fumigating and with the cooperation of WPB and several segments of industry the job should be done.

The first of these attitudes is represented in the manufacturer who feels that he can sell anything because of the pent-up demand for consumer goods. He would produce goods in volume, regardless of quality and durability.

The second can be found in the manufacturer, who because of large sums of money in the hands of the public, would turn out high quality items, but in luxury lines. He would turn out high-end merchandise, rather than essential types so badly needed.

Both of these trends present a real danger to healthy post-war business. It should be pointed out that this type of thinking is in the minority and WPB officials say there is renewed thinking on the part of reliable manufacturers of the public, over and above the profit motive.

THESE two types of thinking will undoubtedly be offset by the current trend toward the imposition of minimum quality standards by civilian supply officials and certain industry groups.

When OPA embarked on its standardization program a hue and cry was with justification raised over the plan and it was labeled "socialism." However, OCR spokesmen, thinking in terms of quality as contrasted with OPA's thinking in terms of regimentation, say that the imposition of standards on goods which are produced as the war draws to a close will be to the public benefit, at least until we have reached a full peace-time economy.

WPB is apparently willing to allow industry to impose these standards upon their own products, and certain industrial leaders who are aware of WPB civilian schedules have already indicated their willingness to do so.

WPB will aid in the production of essential goods first, and not gadgets and doodads, and is looking for the help of forward-looking manufacturers who will be willing to follow a middle-of-the-road course.

If government reforms which are in the making are carried out, and industry faces the future with some optimism and the labor problem can be disposed of, along with many more ifs, 1944 should be a more stable year than any other since the United States entered the war.

o o o

Phoenix Iron Co. to Sell Its Steel under Own Name

• • • **Phoenix Iron Co.**, Phoenixville, Pa., which previously sold fabricated steel under the name of a subsidiary, the Phoenix Bridge Co., soon will sell the product of the fabricating department under the name of the Phoenix Iron Co.

Samuel J. Reeves, president of both companies, said the move will do away with much expensive duplication, adding that except for the resignation of Clyde MacCornack, vice-president, there will be no changes in personnel.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

WHERE'S YOUR BUTTON, GRAMPAW? YOUR IDENTIFI CATION BADGE!
IT'S IN THE ASH CAN WITH THE OTHER TRASH! I THOUGHT I'D LET YOU LOOK AT A HUMAN BEIN' FER A CHANGE··DON'T YOU GIT TIRED OF LOOKIN' AT BUTTONS?
HE SEZ IF THEY KEEP ON WITH BUTTONS THEY'LL KNOW SO LITTLE ABOUT PEOPLE THAT A JAP COULD GIT IN HERE WITH A BUTTON ON!
J. R. WILLIAMS
THE BROKEN CHAIN
T. M. REG. U. S. PAT. OFF. COPR. 1943 BY NEA SERVICE, INC.
12-24

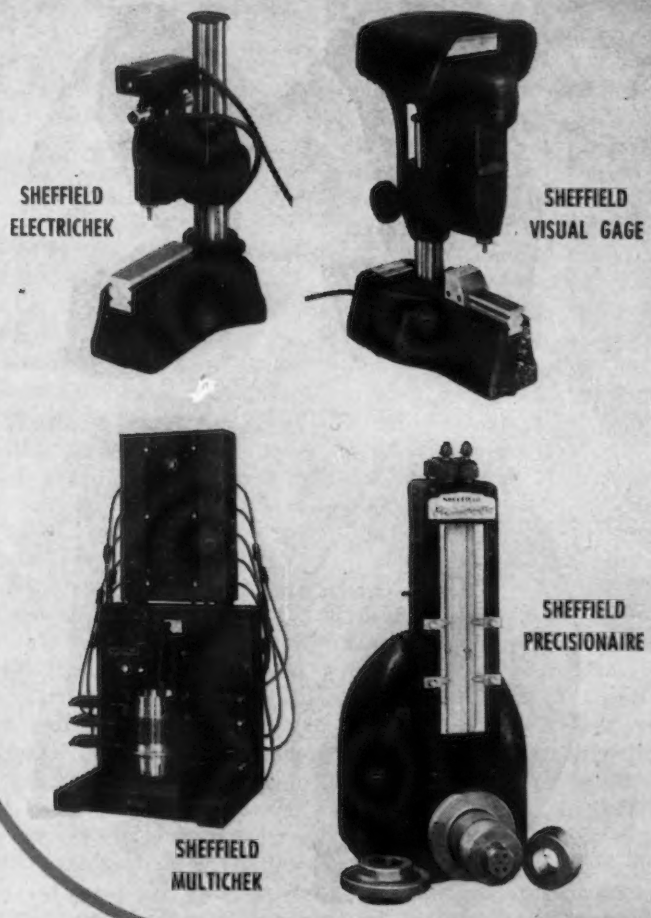
Slowdowns at Republic Increase Cost of Steel Plates

Cleveland

• • • **Thousands of dollars** will be added monthly to the cost of steel plate made in the Cleveland strip mill of Republic Steel Corp., because of the necessity of shipping the plate unsheared to the various ship yards throughout the country. This departure from regular procedure was ordered by the U. S. Maritime Commission and is the result of the slowdown on the plate shearing line that has been in effect since Oct. 9, following a two-day illegal strike. The slow-down has resulted in a loss of ship plate totaling about 20,000 tons per month, Republic spokesmen estimate.

The cost of shipping unsheared plate to shipyards on the Pacific Coast will be increased by as much at $2.89 per ton. This increased cost results from the increased freight on the excess steel that must be shipped and from the difference in scrap price.

don't let faulty inspection cause you to scrap good parts . . . . .



It has been repeatedly found that close tolerance parts rejected by fixed size gage inspection were quite often within limits when checked on a Visual Gage. In other cases, parts accepted by the fixed size gage are rejected by this more precise gaging instrument. The difference is the human factor—skill—experience—temperament—health.

Sheffield Gaging Instruments remove the human factor and in addition provide greater precision and faster inspection all at lower inspection costs. Write for Bulletin No. 43-1 describing the Visual Gage, the Precisionaire, the Electrichek, and the Multichek.

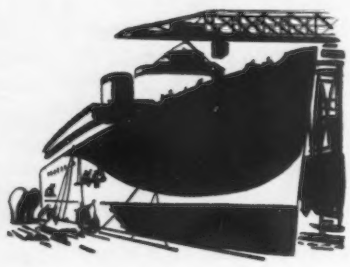
THE **SHEFFIELD** CORPORATION

DAYTON, OHIO, U. S. A.

SHEFFIELD GAGES

WEST COAST . . . OSGOOD MURDOCK

• Instead of dude ranches Arizona tempts war workers for warplane and aluminum plants . . . Marked labor efficiency gains in shipbuilding and war bomber production . . . Douglas angrily resents restless union rumors.



LOS ANGELES—In the midwinter valley of sunshine around Phoenix, Arizona, where balmy summer weather in December and January used to attract affluent visitors and dude ranchers at $25 per day and up, wartime's grim demand this winter is for war housing and more war workers. Superimposed upon intensive agriculture that continues to ship 200 cars of lettuce a day through December along with desert grapefruit, seed crops, livestock and alfalfa hay for feed, industry has moved in on a scale that is big for any community and huge for Arizona.

According to Arizona's governor, 40 per cent of the U. S. domestic supply of raw copper now originates in that state, principally from the Morenci and Globe-Miami districts in the southeastern part. Phelps-Dodge invested $50,000,000 in its new 25,000 ton mill which the Defense Plant Corp. is now doubling. In addition to copper, Arizona boasts that every mineral known to man except tin has been found and is being developed in that state.

Two principal industrial plants at Phoenix, both war born, now present assembly line and mass production problems to people and a region that up to now have been mercifully agricultural, recreational and desert rangy in the leisurely Spanish tradition. Entering the Salt River Valley from the west, 18 miles before one reaches Phoenix, beside the railroad is the new, busy, big aircraft plant operated by Goodyear Aircraft Corp. for the Defense Plant Corp. at Litchfield Park. Within the last 18 months acres of concrete have been spread, huge air cooled buildings erected and millions of dollars worth of machine tools installed. Some 4500 employees, probably 50 per cent women, are fabricating flight decks for PB2Y3 Navy flying boats, wings for Consolidated-Vultee Liberators and wings and other parts for PV-2 Ventura bombers. Completed B-24's are flown in from San Diego for modifications and Navy installations.

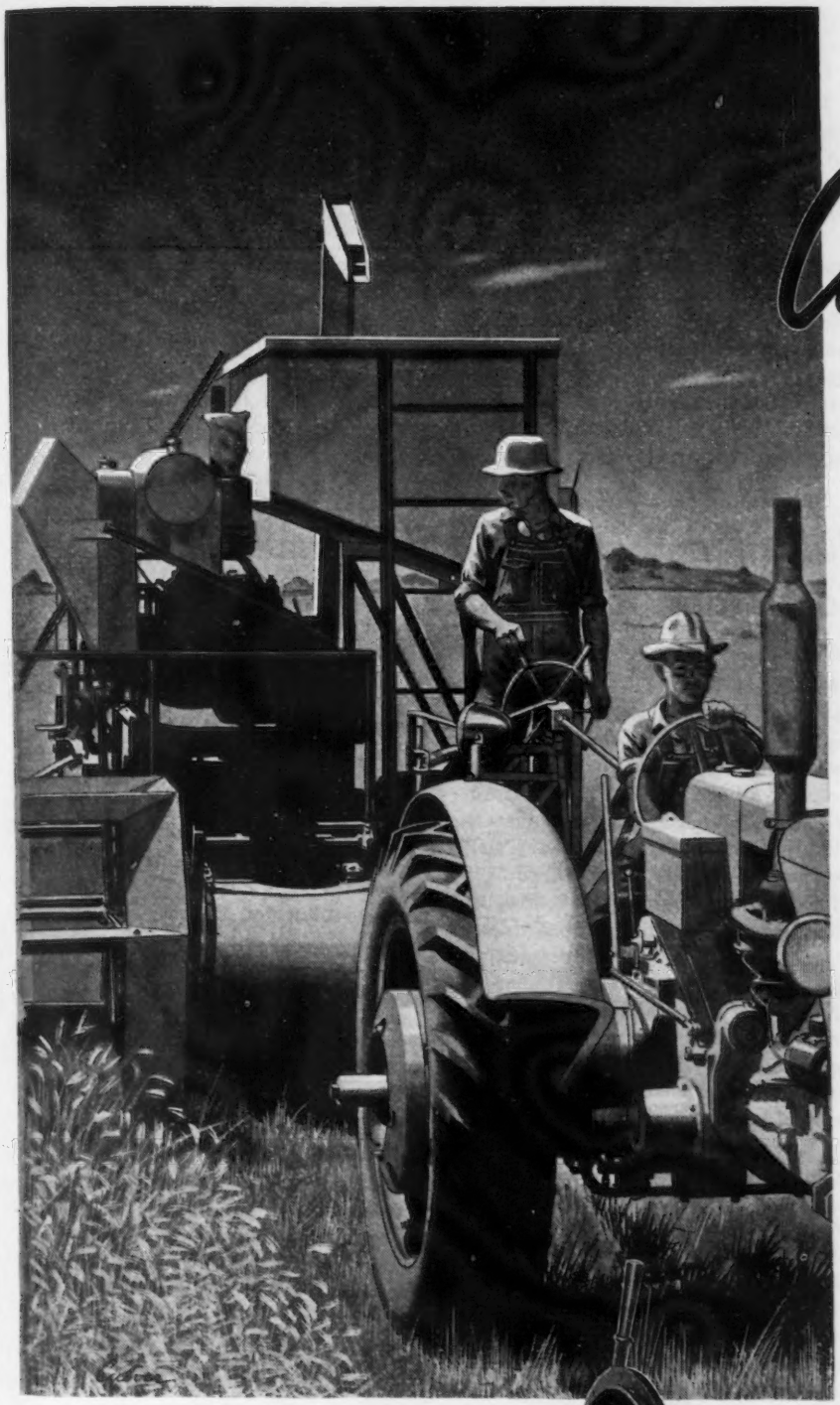
Closer to Phoenix is an even more astounding industrial giant under the thousands of cupolas of the DPC aluminum extrusion plant operated by Alcoa. For this orphan development, placed back from the Coast by frantic Army command immediately after Pearl Harbor, a tract of 320 acres was purchased and the buildings, over half a mile long, cover all but 60 acres. Recently 40 more acres were purchased at $400 each for a housing project. Some 5000 are or should be employed in this entirely unintegrated unit in the nation's haphazard emergency aluminum industry. From aluminum ingots the huge plant extrudes shapes, principally tubular. The labor force has been built up desperately, including recruited Negro women, others from the valley, some tempted from Goodyear's previously hard gathered workers. A large number of workers are housed in new temporary cabins, still building, adjacent to the plant. There is fair bus transportation from Phoenix, six or eight miles away. A pre-war state capital of approximately 80,000 population, Phoenix has mushroomed to something like 150,000. Housing, transportation, food supplies and even recreation opportunities are stretched to bursting. In this land of great open spaces and vast reaches of clear air, barren deserts and lofty mountains, there is now such congestion and such industrial, commercial and communication pressure as seemed inconceivable two short years ago.

To Paul W. Litchfield, chairman of Goodyear's board and prime mover in the corporation during two wars, both Arizona and the aviation industry offer fascinating present and future possibilities. Mr. Litchfield points out that it took the automotive industry 40 years to reach an annual volume of three and a half billion dollars. Yet the aircraft industry in little more than five years is now a 30 billion dollar giant. "Even though we lose 95 per cent of our present emergency war activity in aviation, so that only 5 per cent remain, we still have a sizable national industrial enterprise," points out Mr. Litchfield. Of Goodyear's 110,000 employees, 40,000 are now devoted directly to aircraft production, at Akron and in Arizona.

As Pacific shipyards return to the six-day week, skipping Sundays and holidays and gradually liquidating the graveyard shift, greater attention is directed to organization, labor utilization, increased output per unit and efficient production management. Steady gains have been made, far more substantial than credited in the popular mind. At Cal-Ship, Wilmington, Los Angeles harbor, erected complete in two years from raw tide land for the accelerated Maritime Commission Liberty ship program, a total of three million deadweight tons of shipping have been launched. Welders represent nearly one-fourth of the total personnel of the yard. They turn out 142,000 ft. of manual weld a day, consuming from 75,000 to 80,000 lb. of welding electrodes, a carload of rods and over 40 carloads of plates a day. In each Liberty ship are 224,500 ft. of manual weld. For a Victory ship nearly 24,000 additional feet will be required. In addition, some 34,000 ft. of machine weld go into each ship.

In the first months of the yard's production, welders averaged 20 ft. of weld per welder per day. Now the average is 40 ft., twice the production and double the efficiency per worker.

CORRESPONDING gains in productive efficiency are reflected in aircraft plants. In November 2581 warplanes were produced by West Coast plants compared with 2496 in October. Some 600 of these planes were four-engined bombers, or about 60 per cent of national production.



Cornucopia

ON WHEELS

Famine still strikes in many lands where old methods make it impossible to harvest enough food. That American agriculture feeds our people well, and many others besides, is due in great part to the use of power-driven machinery. The combine, for example, finishes in days what used to take weeks of back-breaking toil, enables farmers to harvest larger crops.

Machinery on countless farms depends on Twin Disc clutches or power takeoffs to link driving and driven units. The reliability and inbuilt stamina responsible for such widespread farm use of Twin Disc products make it easier to dispel one of man's greatest fears—that of famine.

In nearly every other industry too, the Twin Disc Clutch Company's 26 years of specialization in industrial clutch design and manufacture have left their mark. In oil fields and logging camps, on work and fish boats, on machine tools and construction equipment, "Twin Disc" on the clutches, power takeoffs and hydraulic drives is a synonym for smooth operation, long trouble-free wear life and ease of adjustment.

If you manufacture or use equipment embodying both driving and driven units, now is the time to get in touch with Twin Disc engineers. An introduction to our wide line of standard clutches and hydraulic drives, as well as to our extensive application experience, can be worth real money to you. Write for the facts today. TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division, Rockford, Illinois.)

Twin Disc Power Takeoffs enable one engine to do many different jobs. Smooth operating, heavy duty friction clutches, enclosed in housings, deliver full engine torque and horsepower.

Since there have been no net increases in personnel, increased results have been obtained by increased efficiency.

Two years ago, on Dec. 7, 1941, building of a four-engine bomber required manhours equivalent to the work of 70 men for an entire year. Today, just two years later, only 17 workers do the same job, over four times the production per worker.

But 20,000 workers still leave their jobs in aircraft plants every month. Since it costs an average of $200 to hire and train each worker, turnover loss for the current year is estimated to total approximately $48,000,000. All aircraft companies are combining in an appeal for assembly line workers, for they report that two thirds of those who apply for jobs in warplane plants want secretarial or other "overhead" jobs.

WITH discontinuance of the shipment of ingots on Lend-Lease order, two of the furnaces at the Kaiser Fontana mill have been closed down. Since OPA had allowed a special new plant subsidy price of approximately $12 additional per ton on these ingots, Lend-Lease is at a considerable financial advantage to purchase them elsewhere, provided of course that Lend-Lease is interested in financial advantage. Since the structural mill at Fontana is not complete and operating, four open hearths are reported sufficient to supply ingots for the plate mill at its present operating rate.

West Coast foundries are still so short of cast scrap that they are using a melt consisting of 25 per cent steel scrap and 75 per cent pig iron. Recently OPA granted to West Coast consumers the privilege of paying inbound freight charges on cast scrap, equivalent to the preparation in transit privilege, an additional inducement to the movement of cast iron from more remote areas.

A fine of $10,000 has been entered against Samuel Tush and the Pennsylvania Iron & Steel Co. of Los Angeles for substantial violation of OPA scrap orders. The Federal judge is reported to have declared that if the defendant were a younger man he would be sent to the penitentiary because of the extent and nature of the violation. At Seattle injunction proceedings are being tried before Federal Judge Lloyd L. Black involving the Alaska Junk Co., the Seattle Iron & Metal Co., the Cunningham Steel Co. and the Riverside Junk Co.

DOUGLAS AIRCRAFT CO. INC. in southern California is still vehemently denying rumors of layoffs, cancellations and suspension of operation, either actual or contemplated. "The Douglas backlog of unfinished orders today is greater than at any time in its history," declares the company for the benefit of its employees.

o o o

Curtailed War Production Enables Canadians to Produce Civilian Goods

Toronto

• • • **Curtailment** in Canada's war production program is expanding steadily and many materials that formerly held top rating in the essential group have been withdrawn from production lines or their output substantially reduced. Despite the fact that government officials insist there is a serious manpower shortage, it has become apparent recently that many persons, men and women, are seeking employment. Against curtailment in war production schedules, arrangements are proceeding for more expansive production of civilian goods, and it is understood that the turn of the year will see much greater activity in this direction. Already government officials have announced steel releases for civilian manufacturing. Some Canadian steel producers now are seeking new buyers of heavy materials, including structural shapes and plate, while on a number of other materials there has been general easing in supply in the past few weeks. Some producers, however, are fully booked through first quarter with large tonnage carry over into second quarter, although in all instances backlogs are well below those of a year ago.

The Department of Munitions and Supply announced production of army tanks has been sharply curtailed, but there has been increased production of self-propelled artillery which is balancing the tank curtailment. The explosives plant of Defence Industries, Ltd., a government owned company, at Nobel, Ont., will be shut down gradually over a period of several weeks, according to the Department of Munitions and Supply. It is stated that some 3600 workers will be affected.

John R. Read, president of Canadian Westinghouse Co., Hamilton, stated that his company had applied for release of materials to enable it to resume peacetime production of certain lines. It is learned that a number of other companies are preparing to resume peacetime production, including makers of washing machines, refrigerators, radios and a number of other items.

. . . Cited for Awards . . .

• • • **The following firms** have been awarded the Army-Navy E for outstanding war production:

Blackhawk Mfg. Co., Milwaukee.
U. S. Machine Corp., Lebanon, Ind. (white star)
R. Krasberg & Sons Mfg. Co., Chicago. (white star)
American Gas Machine Co., Albert Lea, Minn.
Bigelow-Sanford Carpet Co., Inc., Thompsonville, Conn.
Charles D. Briddell, Inc., Crisfield Plant, Crisfield, Md.
Cribben & Sexton Co., Chicago.
E. I. du Pont de Nemours & Co., Inc., Wabash River Ordnance Works, Newport, Ind.
General Fireproofing Co., Main Plant, Youngstown.
General Iron Works Co., Denver.
General Motors Corp., Chevrolet-Commercial Body Division, Indianapolis; Oldsmobile Division, Janesville Plant, Janesville, Wis.
International Silver Co., Factory "E", Meriden, Conn.
Ken-Rad Tube & Lamp Corp., Owensboro Plant, Owensboro, Ky.
Lattimer-Stevens Co., Columbus, Ohio.
Logansport Machine, Inc., Logansport, Ind.
Glenn L. Martin-Nebraska Co., Fort Crook Reservation, Omaha, Neb.
Louis Marx and Co., Girard Mfg. Co., Girard, Pa.
Ohio Brass Co., Mansfield Plant, Mansfield, Ohio.
Outboard, Marine & Mfg. Co., Evinrude Motors, Milwaukee.
Revere Copper and Brass, Inc., Rome Mfg. Division, Rome, N. Y.
Sylvania Electric Products, Inc., Montoursville Plant, Williamsport, Pa.
Utah Radio Products Co., Chicago.
Wendt-Sonis Co., Hannibal, Mo.

Condensed Version Issued of Diversified Machine Prices

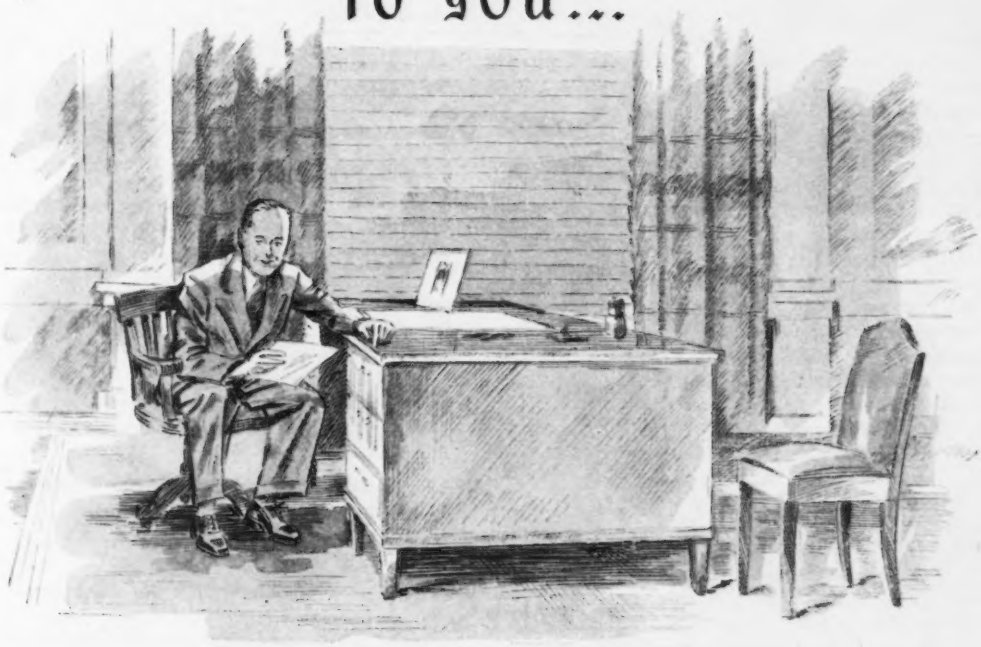
Washington

• • • **As an aid to** the machinery industry the OPA has issued a collation of Maximum Price Regulation No. 136 along with all of its amendments. This collation brings under one cover the diversified orders and price control regulations covering nearly all types of machinery in such a way that the long searches formerly required to get adequate machinery price information can now be accomplished conveniently. A compiled index furnishes an immediate guide.

WE'RE SAYING

Merry Christmas

TO YOU...



and to your Mailman, too.

★ In years past, with the first snowfall, we folks here at Beatty — from the office boy on up — would put our heads together and come up with a Christmas Card to mail to our business friends. But this year, to keep that last "straw" off the poor postman's back, we're foregoing our usual first class greeting, and saying, "*Merry Christmas*" via your favorite magazine. This year, the postman will only ring *once*; we're saying "*Merry Christmas*" to both of you. May your New Year be a happy one — may it bring Victory.

BEATTY MACHINE & MFG. COMPANY

HAMMOND, INDIANA

Fatigue Cracks

Billions of Buckshot

• • • We cried "'Ear! 'Ear!" when the War Advertising Council first came out with its slogan, "A War Message in Every Ad," but lately we have begun to wonder whether the Council is on the right track.

The advertising in your favorite family journal is not concerned, for with the entire industry on war production, every advertisement here is a war message. What we have in mind are ads like the "Old Rottegutte" ad you saw in this morning's St. Louis Globe-Democrat, Detroit Free Press, or New York Times—six columns wide, 16 inches deep.

After reciting the virtues of this eastern Pennsylvania dew, the ad dutifully speaks its piece about buying War Bonds. The "war message" is a kind of afterthought that takes up about 5 per cent of the total space.

The space allotment is fair enough. What we question is the manner of using it. We think the War Advertising Council should urge the Rottegutte people to talk about nothing but Rottegutte in 19 out of 20 ads, but in the 20th to give War Bonds the full stage.

Maybe the Council feels that these billions of little buckshot messages help soften up the target. They may, but on the other hand they may peen it to a surface hardness that makes the job just that much tougher for the shot that has to pierce the armor.

The War Bond postcripts in the "Old Rottegutte" ads, stuck in as a perfunctory postscript, don't soften our armor. We are all for saving up the buckshot and melting it into busters big enough to make a dent.

Concealed Come-On

• • • We would also like to register a small-size squawk about the ads that read, "Don't Buy Our Product. Put Your Money Into War Bonds." Example:

Buy War Bonds Instead of Furs
MORRY MOUTON'S FUR SHOP
537 Main St. (one flight up)
Open till 10 P. M.; excellent selection, small down payment

While abjuring the public not to buy, the advertiser can rarely resist the temptation to flaunt his product's charms. Thus while waving the customers away with one hand he beckons them on with the other. He must know that the hard-to-get technique has never been effective in quenching purchasing or any other kind of passion.

The advertiser is therefore lacking in either sincerity or intelligence. If the latter is the case, the remedy is simple. All he needs to do is to leave out all mention of his product and give out with some straight talk on the inflationary effect of hog-wild buying, and what a peculiar way it is of showing the home front's gratitude to those who are dying for us in battle.

He does not even have to prepare the ads. The War Advertising Council has already worked up some honeys —free to all.

Jack Knife Into Sargasso Sea

Why should Mr. Thomas of the Magnaflux Corp. care whether his trade name is specific or generic?

So long as people consider all cameras to be Kodaks—and ask for them as such—our complaints are made in a low tone of voice, practically a whisper.

—*C. H. Steele,*
Eastman Kodak Co., Rochester 4, N. Y.

When a proprietary name becomes a part of the common tongue a throne is dusted off in the "trademarked royalty" wing of the Hall of Fame. Among the throne holders are Kodak, Celluloid, Ping Pong, Vaseline, and Cellophane, but of all these only one, Kodak, is in our dictionary—and with a small "k."

Trade name law is a Sargasso Sea to us, but we had thought that the danger of permitting a coined name to be applied to other than the owner's product was that the owner risked losing the right to exclusive use of it, and that the name might pass into the public domain. It seems to us Cellophane suffered that fate.

But this is cloudy, and if any member of this page's loyal army of eighteen readers is an authority on the subject will he clear it up.

Aptronym

The Army Air Forces' representative at Buick is Capt. L. B. Flack.

—*Sedna Boyle,*
Automotive Council for War Production, Detroit

Too Early, Too Late

• • • For the benefit of the historian who records the home front horrors of World War II we would like to report that at 5:45 p. m. one day last week we stopped at Detroit's Book Cadillac bar, in company with Stanley Howard ("The Assembly Line," see page 70) Brams, your Detroit lookout, and ordered a Scotch and soda. We were told that Scotch was rationed and none would be served until 6 p. m. We returned at 6:20, repeated our order, and were told that we were too late. The Scotch ration for the day had been exhausted.

Stuffed Shirt Destarching at GM

• • • Stan told us that when any General Motors executive gets too big for his britches he is taken to one of the upper floors of the General Motors building in Detroit and asked to look out of a window affording a clear view of a large capital "D" carved on certain capstones. He is told that originally the structure was to have been known as the Durant Building, in honor of William C. Durant, who was then head of General Motors, and who now runs a bowling alley some place in Michigan.

The executive who is too big for his britches is supposed to ruminate on Fate's quirks and to acquire humility in one quick surge. What they do with him if he does not, Stan did not say.

Etymological Epicure

Move over your authority on retromingency and make a place for an unreconstructed Republican business man I overheard the other day say, after emerging from one of our Nissen huts along the mall, that he had developed a fine case of kakidrosis trying to get anywhere with that kakistrocratic bunch.

—*Berryman Davis, Attorney,*
Federal Trade Commission, Washington

Our drugstore dictionary informs us that the unreconstructed Republican businessman with the stylish stout vocabulary said he had acquired body odor (*kakidrosis*) trying to get along with members of government by the worst class (*kakistocracy*).

Retromingency is in there, too, but its application is so highly specialized that there is no point in burdening your mind with it.

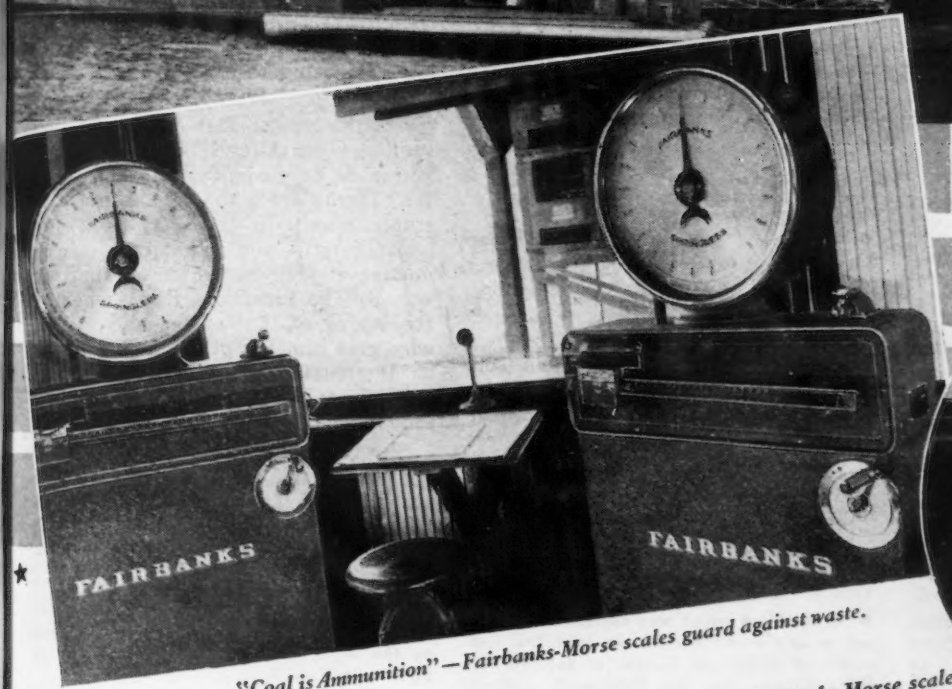
Puzzles

Last week's furniture buyer bought 10, 10, 6, 4, 2 and 1 suites. This should yield to your cerebrum within three minutes:

For their common meal Caius provided 7 dishes and Sempronius 8. But Titus arrived unexpectedly, so all shared the food equally. Titus paid Caius 14 denarii and Sempronius 16. The latter cried out against this division, and the matter was referred to a judge. What should his decision be, granting that the 30 denarii is the correct total amount?

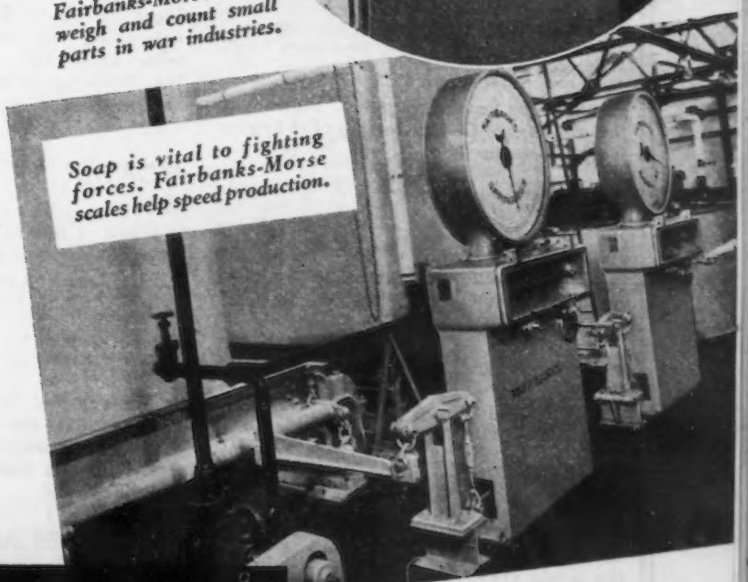
In Wartime Production . . .
It's *Every Ounce* That Counts!

Fairbanks-Morse scales weigh cargo and crew before clipper ships take off for unannounced destinations.



"Coal is Ammunition"—Fairbanks-Morse scales guard against waste.

Fairbanks-Morse scales weigh and count small parts in war industries.



Soap is vital to fighting forces. Fairbanks-Morse scales help speed production.

• OUNCES make pounds and pounds make tons . . . *millions of tons* of wartime production that pass over Fairbanks-Morse scales to help speed the allies to victory.

Food . . . steel . . . munitions . . . chemicals . . . guns . . . tanks . . . textiles . . . *anything and everything* that goes to war must be weighed. It must be weighed accurately . . . quickly—at speeds which human hands can't match, and with accuracy that human eyes can't equal. That's why industry, from the smallest to the largest, finds Fairbanks-Morse scales indispensable in keeping production lines rolling.

If you have weighing problems *now* or if you are *planning ahead* . . . let the Fairbanks-Morse Scale Engineering staff help *you* as it is helping so many others. Write, wire, or phone Fairbanks, Morse & Co., Fairbanks-Morse Building, Chicago 5, Illinois.

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FAIRBANKS SCALES

Scales

Dear Editor:

COLD HEADING PRACTICE

Sir:

We are preparing a handbook of cold heading theory and practice for use in our own organization. It will cover the cold heading of rivets, bolt and screw blanks, and miscellaneous cold forged products. Have you any information we can use?

R. CHESTNUT,
Supt. Rivet Dept.
Aluminum Co. of America,
Edgewater, N. J.

● See the series on this subject in the June 9, June 23, July 7 and 14, 1938 issues. Also suggest you write to Lamson & Sessions, 1971 W. 85th St., Cleveland, for a book entitled "Bolts, Nuts and Screws," by A. E. R. Peterka, price $1. It contains data on the design and production of cold headed and threaded products.

LOST DECIMAL POINT

Sir:

We note on page 45 of your Nov. 11 issue a statement to the effect that 20 lb. of molybdenum was consumed per net ton of alloy steel ingots produced. Is this figure correct?

ASTRID SPELLMAN,
Technical Analyst
Rustless Iron & Steel Corp.,
3400 E. Chase Street,
Baltimore 13

● The item in the News Front was incorrect. The figure should be 2.01. The figures for the other alloying elements were correct.—Ed.

GLASS FIBERS

Sir:

How can we obtain further information of the studies made by Dr. F. O. Anderegg in relation to glass fibers, referred to in "Glass Fibers—A New Engineering Material," on page 61 of your Nov. 4 issue?

J. H. HOLLOMON,
1st Lt., Ordnance Dept.
Watertown Arsenal,
Watertown 72, Mass.

● Write to Edward C. Ames, assistant to the president, Owens-Corning Fiberglas Corp., Nicholas Bldg., Toledo 1.—Ed.

NE STEEL CHART

Sir:

Please send us two copies of The Iron Age Standard Steel Chart, showing the different analyses of the comparative AMS, SAE and NE steels.

F. C. REILLY,
President
F. C. Reilly, Ltd.,
Chrysler Bldg.,
New York 17

● Charts have been sent. Price 25c each.—Ed.

DIE STAMPING

Sir:

Please furnish us with more information in regard to a method of making a big stamping and a little stamping both from the same die, as mentioned on page 76 of the Nov. 4 issue.

RICHARD E. WAITE
Stromberg-Carlson Co.,
Rochester, N. Y.

● Write to General Electric Co., Schenectady, N. Y.—Ed.

ELECTRIC FURNACE-BRAZING

Sir:

Is it possible to obtain reprints of "How and Where to Use Electric Furnace-Brazing" by H. M. Webber of General Electric? We understand this ran as a series in THE IRON AGE issues during 1938 and 1939.

J. E. D. McCARTY
Simmonds Aerocessories, Inc.,
10 Rockefeller Plaza,
New York

● We believe General Electric Co., Schenectady, N. Y., can still furnish copies.—Ed.

FATIGUE STRENGTH OF STEEL

Sir:

Please send me a reprint of the article "Improving Fatigue Strength of Machine Parts" by J. O. Almen. This appeared on page 65 of your June 10 issue.

C. A. LINDEMANN
General Electric Co.,
1285 Boston Avenue,
Bridgeport, Conn.

● No reprints are available. A clipping has been sent you.—Ed.

STEEL RATES

Sir:

I was very much interested in Tom Campbell's article on page 91 of your Nov. 18 issue on steel rates for the past 300 months. What was the source of the material for the period 1919-1925 on which a portion of the chart included in the article was based?

H. C. STROHM
Stillman, Maynard & Co.,
61 Broadway,
New York 6

● In deciding which was normal and which was a depression month, we took the University of Pittsburgh, Bureau of Business Activity figures for the Pittsburgh district. Those months for which the activity figure was above 100 we called "normal," and those below 100 we called "depression." The Pittsburgh business activity was used because it is predominantly iron and steel.—Ed.

STOP NUT

Sir:

What is meant by "stop nut?" Is it an old mechanical term? Is there a mechanical dictionary definition of it?

F. GREER,
Manager
Fredric Greer Co.,
2620 W. Flournoy Street,
Chicago 12

● We can find "stop nut" in no mechanical handbook, but the unabridged defines it as "An adjustable nut (of an adjusting screw) used to limit motion in a particular direction."—Ed.

MANPOWER ANALYSIS

Sir:

How can we obtain a copy of "Manpower Analysis," 78 pages, for use in our library?

JOHANNA M. WIESE,
Librarian
Ford Airplane School Library,
Willow Run Bomber Plant,
Willow Run, Mich.

● Write to Aircraft War Production Council, Inc., 7046 Hollywood Blvd., Los Angeles.—Ed.

SINGLE STITCH

Sir:

When war breaks out any place, the first thing they do is to open wide the gates of all the bughouses and let the inmates out to control the activities of the rest of mankind. It must have been one such inmate who directed you to use but one wire staple in sewing each copy of your magazine. They may look fine and pristine when they leave your plant, but by the time they get here the pages are all playing ring-a-roses around that one centrally stuck staple. And by the time they start their travels among the avid members of our technical staff each copy looks like something rescued from the family pup.

For the love of Piet (South African spelling) what good can one more staple do towards winning the war? Why if you stuck that one extra wire staple plumb in the seat of Tojo's pants he still wouldn't quit. If some maniac at your end contends that the war will be finished a day sooner by the saving of that one measly staple, why give him the other one and send us the damn thing loose-leaf and I will take it home and do some blanket-stitches down the back.

Surely the salvation of all mankind doesn't hang on that one measly staple. And if it does, why let's wipe it out anyway. Maybe it isn't worth saving in that case.

R. W. OSBORN
293 Rissik Street,
Pretoria, South Africa

● The single stitch annoys us, too. As soon as the wire situation permits, we will go back to two.—Ed.

SEIZED FOREIGN PATENTS

Sir:

Please send me a reprint of the lists of foreign patents covering metal products, which you have been publishing serially. 24c. in stamps is enclosed.

HENRY F. GASTON,
Industrial Engineer
4306 51st Street,
Hyattsville, Md.

Sir:

Enclosed is 24c. in stamps for which please send the 22-page reprint of the lists you have published of seized foreign patents. We would like to receive future lists.

C. V. PYNE,
Chief Structural Engineer
Emsco Derrick & Equipment Co.,
Los Angeles

● The reprint includes all lists published up to and including those in the Nov. 2, 1943 issue. For additional lists, see page 116 of the Dec. 2 issue, page 112 of Dec. 9 issue, page 100 of Dec. 16 issue, and page 114 of this issue. More to come.—Ed.

Fantastic postwar products are intriguing, certainly —but design engineers and production men realize that practical, economical products must be made. This will be no wonderland. Competitive markets and stored-up needs will keep manufacturers on solid ground. Light, strong, steel stampings improved many civilian products before the war, and will continue to do so in peacetime manufacturing. With years of valuable experience in designing and producing deep drawn stampings, Transue's may be of valuable assistance in your postwar plans.

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This Industrial Week . . .

- ***National Ingot Production Goes Into Steep Spin***
- ***Surplus of Raw Steel Will Be Trimmed by Action***
- ***Easiness Will Bring Revising of Allocation Orders***
- ***Shipyards Ask More Steel; Army May Tighten Demand***

STEEL ingot production went into a very sharp decline this week, reflecting the growing surplus of raw steel over the nation. Apparently acting upon authority from Washington, several steel companies adopted the policy of giving as many of their employees a holiday as possible, without interrupting production against directives. Thus, plate mills and other units whose output is vital to the war effort, will continue to roll at full speed, but the surplus of ingots, which is being studied by the WPB, will be cut down.

National ingot production is estimated at 91 per cent of capacity from last week's rate of 98.5 per cent. The drop will not jeopardize to any great extent the steel industry's unprecedented production for 1943, expected to be around 89,000,000 net tons of ingots, only a few million tons short of equaling total steel output of the balance of the world.

The steel industry's product mix continues unbalanced to a greater degree than at any time since Pearl Harbor. Delivery promises on flat rolled products steadily are becoming more extended into 1944. Orders for bars, structural items and several other products, which were well distributed several months ago, are spotty as to sizes and grades.

Despite the fact Maritime yards have been ordered onto a six-day week instead of a seven-day schedule, Maritime has told WPB it needs more steel than ever. It is possible that the scheduled increase of plates to the Maritime Commission to nearly 600,000 tons monthly by the new troop transport program accounts for the greater demand. WPB hopes plate production in first quarter will be 3,355,000 tons, an all-time high mark.

Tighter than ever will be the flat rolled picture if the Army goes ahead with plans to use steel in ammunition boxes instead of wood or some composition material. The decision has not been made finally.

THE abolishment of pig iron allocations is expected in February. It is possible allotments of molybdenum and vanadium for January will not be made since the order revoking this procedure may be issued in time to make allocation needless. Cobalt and tungsten allocations will not be made after January. High carbon chrome no longer is allocated. Controls over low carbon chrome and nickel are expected to be retained, although in the case of the latter, informed executives look for the easing of restrictions eventually. The easiness in chrome and nickel are evidenced by WPB's action making these alloys available for truck engine valves.

The melting of chrome and molybdenum grades of alloy steel has dropped sharply during the past year, while a steep rise in chrome-nickel-alloy grades has taken place. During one recent month the melting of National Emergency steel accounted for 46 per cent of total alloy steel production.

At the same time the excess of alloy scrap has risen until 100,000 tons per month is being generated above consumption. This is despite the fact one-half of the nickel being melted comes from scrap and about one-quarter of the chrome, and 40 per cent of the molybdenum, and about 70 per cent of the tungsten used in high speed steel.

The fact that limitation orders are being reviewed with a view toward easing them and abolishing unnecessary restrictions upon civilian production has been reported frequently. WPB Chairman Nelson confirmed the reports last Friday, emphasizing that the action does not necessarily mean any substantial increases in the production of consumer goods. The availability of steel is only one of a number of factors limiting civilian production, he said, adding that over-all demand for steel continues strong. Products made out of plates, sheets, strip and tin plate will remain scarce due to the tremendous demand on these items for war, but it may be possible before long to divert bars, shapes and some wire products for increased civilian use.

As the negotiations went forward at Pittsburgh last week upon the steel union's request for higher wage rates, the effect of a possible advance cast a shadow of a doubt over steel markets in that some mills were not anxious to accept orders carrying the stipulation that shipments will not be made against the order except at the current price without first consulting the customer.

THE jockeying at Pittsburgh seemed to be putting the War Labor Board in a difficult position. Philip Murray, CIO head, demanded that any steel company that did not agree to an extension of contract with a retroactive date to Jan. 3 should be ordered to do so. Benjamin F. Fairless of U. S. Steel insisted that the board issue no orders that a retroactive date be set if a wage agreement calling for an increase was finally arrived at. Steel companies already are faced with the need to consider the necessity of seeking price relief because of existing increased costs, said Mr. Fairless.

If the WLB does not take action one way or another on the retroactive stumbling block before present

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contracts expire some observers look for another outbreak of outlaw strikes in steel.

In addition to the steel wage negotiations, the threatened strike of 350,000 railroad workers is worrying all industries. Other labor developments include the seizure of five strike-bound plants of Western Electric Co. in and near Baltimore, a two-day work stoppage at the Cleveland yard of the American Shipbuilding Co. and several short strikes in the steel industry. The National Tube Co. "cutback" strike ended after four days last week but Pittsburgh Steel Co. was affected by a one-day walkout at one of its plants, and the American Chain & Cable Co. had an unauthorized strike on its hands at the week-end at one plant.

The thinking of war agency officials is tending more and more toward the lumping of all war settlements in one final transaction with contractors. Highly significant is the revelation that whenever possible the War Department is making termination and renegotiation a simultaneous process. This provides a means of by-passing the General Accounting Office. Only when all of a contractor's agreements with the government are canceled at the same time can the new method be used.

The Senate Finance Committee last week amended the House-approved renegotiation provisions of the new tax bill to such an extent that Administration supporters claim that the purpose of the renegotiation process has been voided. Segments of industry which had suffered under repressive renegotiation hail the Senate amendments as a lifesaver. The most important of the changes was the portion which permits the reopening of renegotiated settlements in the court of claims.

WITH the government now distributing vast quantities of idle and excess steel, often at prices well below the levels prevailing for new material, steel warehouse operators have cause for concern even though specific losses of business have been uncovered only rarely so far. As a matter of fact, even some steel mill executives are perturbed at the implications of redistribution at low prices by numerous agencies.

A 50c. per ton increase on machine drawn beehive coke and a boost of 75c. per ton on hand drawn beehive coke at Connellsville regions are expected to be announced officially by OPA soon. The increases would take care of higher costs.

OPA's efforts to hold prices down are nearing a severe test, especially since high labor costs are threatened.

With discontinuance of the shipment of ingots on Lend-Lease order, two of the furnaces at the Kaiser Fontana mill have been closed down. Since OPA had allowed a special new-plant subsidy price of approximately $12 additional per ton on these ingots, Lend-Lease is at a considerable financial advantage to purchase them elsewhere, provided of course that Lend-Lease is interested in financial advantage. Since the structural mill at Fontana is not complete and operating, two open hearths are reported sufficient to supply ingots for the plate mill at its present operating rate.

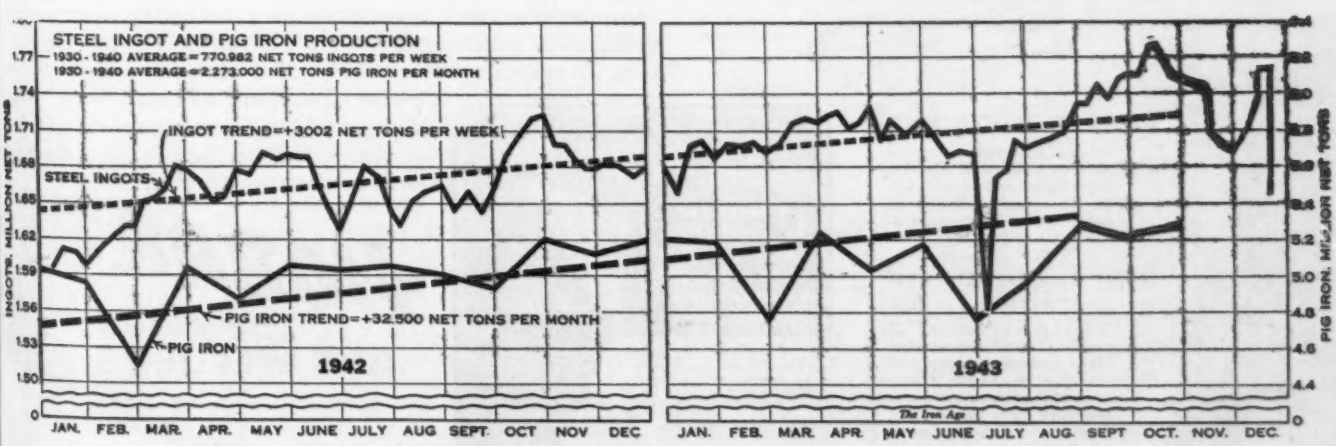
Pig Iron Controls May Halt in February

Washington

• • • Pig iron allocations are expected to be lifted in time so controls will be relaxed in February, 1944. January allocations have been made, according to Steel Division officials.

A series of order relaxations—ferroalloys, is in process. Cobalt and tungsten allocations will be made for January. It is possible, however, that allotments of molybdenum and vanadian for January will not be made, since the order revoking this procedure may be issued in time to make allocation needless. Cobalt and tungsten allocations will not be made after January.

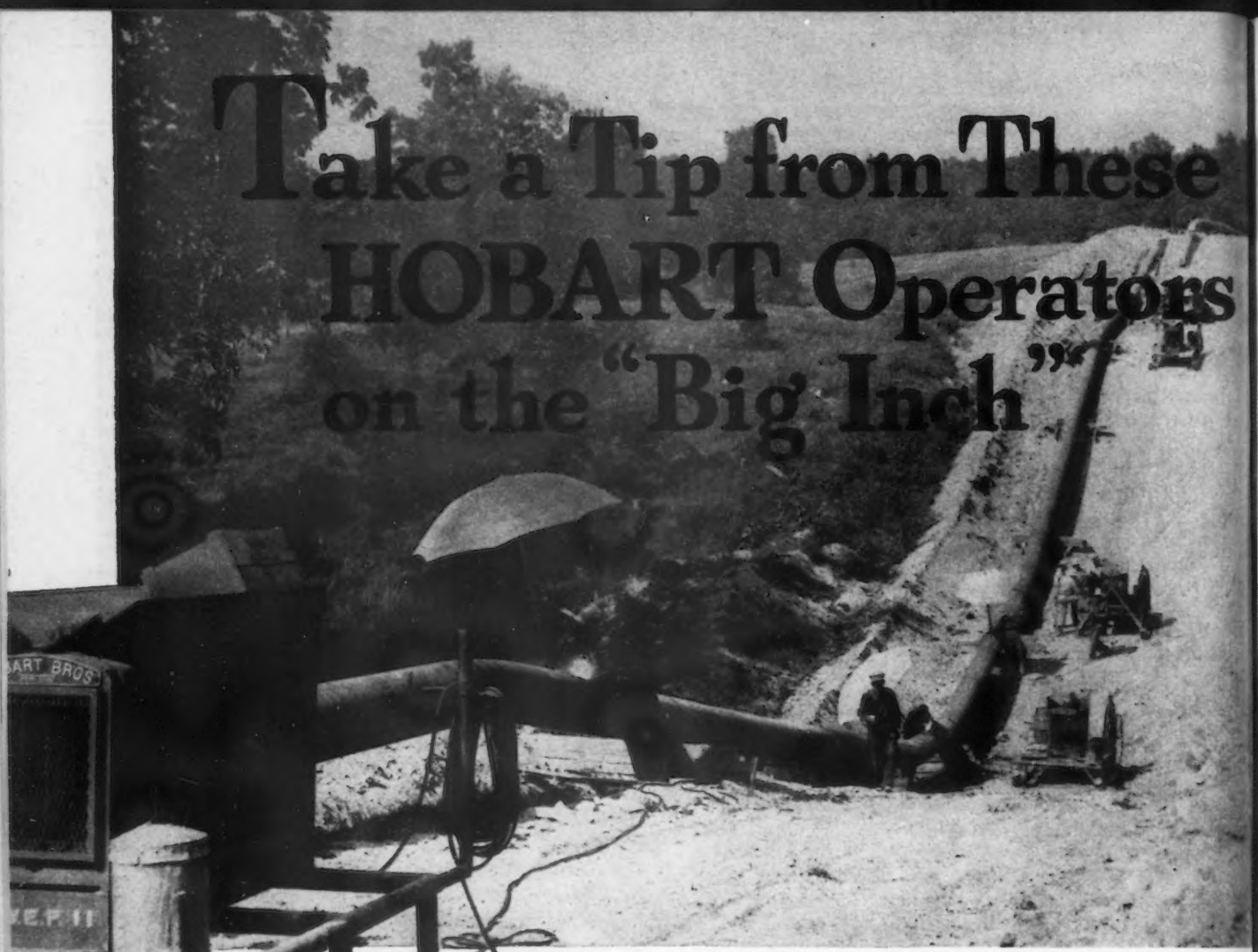
High carbon chrome is no longer allocated, but it is expected that controls over low carbon chrome and nickel will be retained for a while at least. In "This Industrial Week," Nov. 11, it was stated that relaxation of pig iron controls was a possibility. In this magazine Nov. 25, page 91, it was specifically stated that the Steel Division has orders in process to abolish allocation controls over pig iron and all ferroalloys except columbium and tantalum with low carbon chrome and nickel.


STEEL INGOT AND PIG IRON PRODUCTION
1930-1940 AVERAGE=770,982 NET TONS INGOTS PER WEEK
1930-1940 AVERAGE=2,273,000 NET TONS PIG IRON PER MONTH
INGOT TREND=+3002 NET TONS PER WEEK
STEEL INGOTS
PIG IRON TREND=+32,500 NET TONS PER MONTH
PIG IRON
INGOTS, MILLION NET TONS
PIG IRON, MILLION NET TONS
1942
1943
JAN. FEB. MAR. APR. MAY JUNE JULY AUG SEPT OCT NOV DEC
The Iron Age

Steel Ingot Production by Districts and Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
December 16...	99.0	102.5	98.0	93.0	95.5	99.5	95.0	99.0	101.5	95.0	95.0	108.0	95.5	98.5
December 23...	91.5	93.0	79.0	92.5	91.0	99.5	95.0	99.0	104.5	95.0	88.0	108.0	85.0	91.0

Take a Tip from These HOBART Operators on the "Big Inch"



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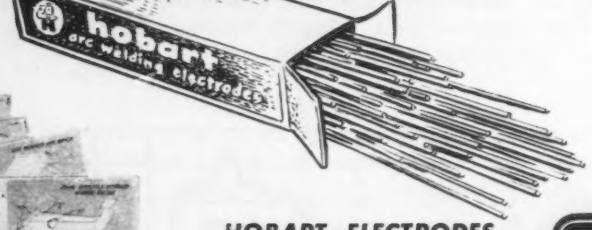

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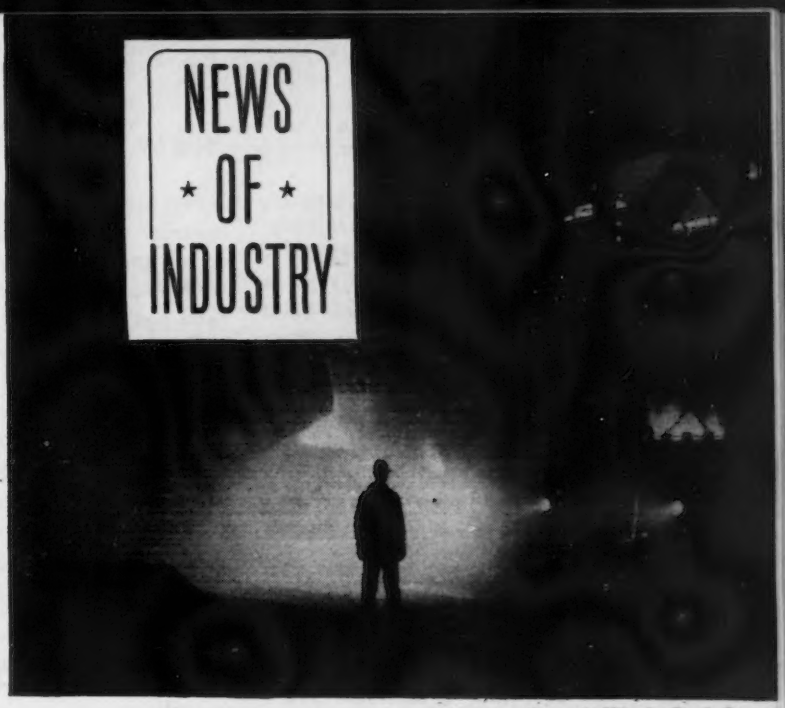
NEWS OF INDUSTRY



Courtesy Carnegie-Illinois Steel Corp.

MOLTEN *pig iron being charged into an open hearth furnace.*

Simplification in Settlement of War Accounts Attempted by War Department; GAO By-Passed

Washington

• • • **Whenever** it is possible the War Department is making termination and renegotiation a simultaneous process, a War Department spokesman said last Friday.

Besides the administrative advantages of procedural simplification in settlement of war accounts with the government, it is reported that the War Department will use this device to prevent the General Accounting Office from having anything to do with the review of terminations.

Obviously, if termination is made a part of renegotiation, and the procurement agencies alone have the power to renegotiate under the law, the GAO will be precluded from reviewing contracts treated in this manner.

The only time it is possible for termination and renegotiation to be simultaneous is when all of a contractor's agreements with the government are canceled at the same time.

However, this procedure is not satisfactory to the House Military Affairs Committee which is insisting upon Comptroller General Lindsay C. Warren having a part in the examination of contract settlements.

The thinking of war agency officials is tending more and more toward the lumping of all war settlements together in one final transaction with contractors. Thus, a contractor's debts to the government such as taxes and amounts due under renegotiation might be set off against what the government may owe him under a contract cancellation settlement, and for reconversion costs which may be legislated.

If some such formula as this is finally worked out, the saving of time and worry from an administrative standpoint to both government and industry will be tremendous, officials who propose the plan say.

The Army and Navy for the first time have agreed on a uniform standard determination clause which is reported to conform to legislation now before the Murray (Senate) Small Business Committee.

And while the armed services and the Murray Committee have been quite busy blueprinting what they want in the way of legislation, the House Ways and Means Committee is waiting to see how the Senate will react to the Army and Navy proposal before it reports out a bill of its own.

Of course the Murray proposal eliminates GAO review and reposes termination authority in the procurement agencies. Also, the Murray bill sets up a contract termination board within the Office of War Mobilization, confirming what Justice Byrnes has already done.

In this connection, WPB which does not now have a position on the termination board, may find a place to present its ideas on the subject if the Army's device to make termination a part of renegotiation becomes a settled policy. The WPB has a place in the renegotiation setup. Consequently, WPB is pulling for the making of cancellation a part of renegotiation.

With all of the talk about reconversion which has gone on, very little solid and settled policy exists which industry can rely upon definitely. At this point, the war agencies are just thinking about policies which should govern the choice of companies to be terminated first and when the armed services decide to abolish or cutback a program.

WPB Chairman Donald Nelson is known to be in agreement with an influential Army and Navy faction who favor keeping the low cost war producers in business the longest period.

How Germans Size Up Wealth of the Ukraine

• • • Frequent reference has been made in the news section of this magazine to proposals by high government officials for trading surplus machine tools in return for strategic raw materials from other nations, notably Russia and China. In this connection, a report on the mining and iron industry in the Ukraine, published by *Stahl und Eisen*, July 16, 1942, may be of interest. Following are extracts from the report:

Coal: The Ukraine's largest coal reservoir, situated in the Donetz basin and distributed over an area of 25,000 sq. km., has resources estimated to amount to 90 billion tons of coal.

Power Production: In 1937 the capacity of Ukrainian power stations amounted to 1.98 million kw—almost a quarter of the total capacity of power stations in the Soviet Union.

Metallic Resources: Iron ore deposits in the section represent the most important in the Soviet and the manganese deposits contribute about 20 per cent of world production. In 1937, 8.8 million tons of pig iron and 8.5 million tons of steel were produced. Bauxite mines, in 1937, supplied a large Dnieper plant with enough material to produce 60,000 tons of alumina, 40,500 tons of electrolitic aluminum and 67,000 tons of electrodes. The zinc plant, located in the Stalino district, has a production capacity of 13,000 tons and operated at 100 per cent capacity.

Coke: Annual capacity of coke produced in the Ukraine amounts to 22.5 million tons.

This means that the least efficient are going to be terminated first.

When it appears that this policy is settled, a great furor is likely to be raised in Congress observers point out, because it may have the effect of giving certain localities, towns and cities, and possibly certain sections of the country the competitive advantage of an early start on peace production. Congressional kicks will be generated by business and labor groups who may feel they have been discriminated against.

Letting least efficient war contractors gets into civilian production first may prove a boon rather than a disadvantage to those companies, most of which are smaller than the average low cost producer. The proponents of small business see this move as one of the few breaks the "small" business man will get out of the war.

High administration officials declare that the great governing principles in reconversion are going to have to be economy and the most equitable methods possible. These officials say these principles must govern because of the new economy drive in Congress, and because industry itself will insist.

But nothing very definite has been decided upon because Congress is also insisting on calling the turn on all policies to be followed in the demobilization of industry. It is clear that Congress is in a high state of confusion and disagreement on all of these matters, which does not promise any early firm determinations.

Another discouraging factor to business is the fact that the Army and Navy are not giving publicity to the contract terminations which are projected and under way. A headache stemming from this armed service faux-pas is that War Manpower Commission figures on manpower supply are consequently highly imaginary, not to say inaccurate.

With no idea of where the big cutbacks are coming, or when, neither WPB nor manufacturers can make any very definite plans because they have no advance knowledge of what plants, materials and manpower are going to be available in any business locality.

The December-to-July manpower requirements of industry and the armed services are 2,500,000 men, according to an official source. The Army and Navy claim that they need 1,300,000 men. War industry's need is set at 1,200,000 workers.

However, the number of men to be released by the new cutbacks has not been taken into consideration. Consequently, WPB officials at least, think that there will be no difficulty in meeting the manpower demands.

o o o

Drastic Changes in Renegotiation Made

Washington

• • • **The Senate** Finance Committee last week amended the House-approved renegotiation provisions of the new tax bill to such an extent that Administration supporters claim that the purpose of the renegotiation process has been voided.

The provisions have been drastically amended and segments of industry which had suffered under repressive renegotiation hail the Senate amendments as a lifesaver. The most important of the changes was the portion which permits the reopening of renegotiated settlements in the Court of Claims. The House had provided for recourse to the Tax Court. This would eliminate the bad feeling caused when, in most cases, the findings of the Price Adjustment Board were final.

The Senate also knocked out the repricing clauses and provided for determination of excess profits after payment of estimated Federal income and excess profits taxes. A bitter fight on the "renegotiation after taxes" clause is expected on the Senate floor, and the Administration will be out to kill this feature of the bill.

Manufacturers of standard commercial articles are also exempt from renegotiation under the Senate plan. A provision was inserted which requires all contracts above $100,000 to contain a clause requiring the contractor to submit to renegotiation.

However, the Committee approved the House provision which exempts contractors whose business in a fiscal year does not exceed $500,000 from renegotiation.

Senate Committee provisions also provide for renegotiation of profits actually received or accrued, in contrast with the vaguely worded House provision which includes profits "realized or likely to be realized."

The Senate group also provided for the appointment of a WPB member to the War Contracts Price Adjustment Board and that financial problems in connection with reconversion be considered in determining excessive profits.

The Administration objects to all of the changes. Most of the opposition is centered around the clause which permits the reopening of all settlements in the Court of Claims, even though they may have been agreed to by both the contractor and the Government. These closed cases may be opened, but under Committee provisions future agreements by both parties may not be reopened.

The tax bill which the Senate committee will report this week is deemed to be so objectionable to the Administration that officials privately are predicting a veto unless changes are made in the measure.

Plan Disposition of U.S. Owned Plants Now, Justice Department Official Urges

• • • "What to do with government financed war plants after their need for war production has passed poses one of the large problems in the reconstruction of a peace economy"—so spoke Fred E. Berquist, special assistant to the Attorney General, Department of Justice, in a recent speech before a Round Table Conference of the National Industrial Conference Board. Mr. Berquist emphasized the need for an orderly liquidation of plants by sale or lease. The following is a condensation of his talk:

Latest breakdown of WPB tabulations indicate the authorized cost for publicly financed, industrial facilities to be $15,555,000,000. The figure does not include projects of less than $25,000 nor $2,378,000,000 committed for machine tool purchases by the War and Navy Departments and DPC. It is estimated that approximately $1,850,000,000 of facilities will be added or completed during 1944. The accompanying table shows distribution of plants by general product categories:

Product Classification	No. of Plants	Amount
Aircraft, aircraft engines, parts and accessories	353	$3,150,000,000
Ship construction and repair	227	2,145,000,000
Combat transportation and other motorized vehicles	72	425,000,000
Guns	209	816,000,000
Ammunition, shells, bombs, etc.	315	1,069,000,000
Explosives and ammunition loading and assembling	81	2,872,000,000
Iron and steel products.	240	1,231,000,000
Non-ferrous metals and their products	135	1,160,000,000
Machine tools and other metal working equipment	186	155,000,000
Machinery and electrical equipment	331	475,000,000
Chemicals	177	1,118,000,000
Petroleum and coal products	40	202,000,000
Miscellaneous manufacturing	287	292,000,000
Non-manufacturing (power lines, mining, etc.)	200	444,000,000
Total	2,598	$15,555,000,000

It can be noted from the above that approximately one half of the total investment represents construction and the other half machinery and equipment. Peacetime utilization of shipbuilding, aircraft and ordnance facilities will probably have a low degree of convertibility and much of the equipment in other facility categories is highly specialized for war products and not adaptable to civilian production.

A uniform rule for conversion will not work out as the varied sizes of the plants will have to be considered. Just a few hundred of the 2600 plants shown in the above table probably account for at least 80 per cent of the total investment, so that disposing plants costing $20,000,000 to $100,000,000 each will be quite unlike disposing those running from $50,000 to a few million dollars.

There are two broad alternatives of policy in the disposition of war plants—immediate disposition regardless of price, and disposition involving considerations of economic benefits as well as ultimate recoveries. Quick disposal might readily be arranged by making necessary price and term concessions. It is doubtful, however, whether the people generally would tolerate the creation of many windfalls to private industry which would accrue under such a policy. This policy also might result in terrific and inequitable impacts upon an established industry. The net effect would be one of future boomerang in the economy. On the other hand, orderly liquidation of plants by sale or lease would probably result in not only maximum economic benefits for the nation as a whole but also maximum dollar recovery.

Practically all leases for the operation by private corporations of plants financed by DPC provide options for the purchase by their operators except the following groups of plants:

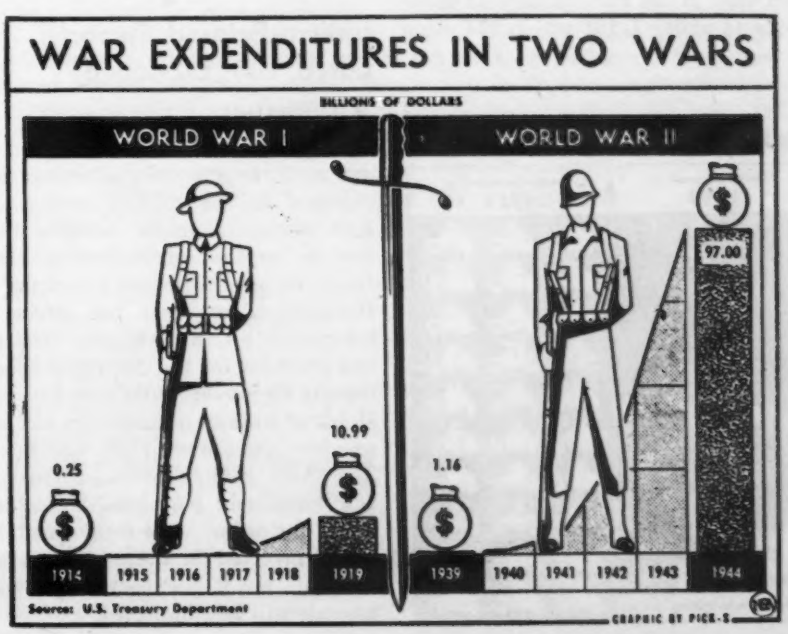
1. Aluminum—including alumina and aluminum metal reduction, and aluminum fabrication and processing plants leased to the Aluminum Co. of America.
2. Magnesium metal plants, with the exception of one small scrambled plant operated by Dow Chemical Co., Freeport, Texas.
3. Rubber and its component raw materials (butadiene, styrene, etc.).
4. Steel plant at Geneva, Utah, and Studebaker Airplane plant at Fort Wayne, Ind., the total cost of which is about $275,000,000.
5. About $50,000,000 of additional plants scattered in various industries.
6. Pipelines—Big Inch, Little Big Inch, extension of Plantation Pipe Line, Trans-Florida Pipe Line, etc.

Therefore, of the total value of industrial plants financed by DPC of 6.8 billion dollars, approximately 5.35 billion dollars, or 80 per cent, is subject to purchase options by the operators.

The option has the following features:

1. It may be exercised only for *all* the facilities covered by the lease—not for such parts as the lessee may select.
2. It does not run beyond a brief period (generally 90 days, but 120 days in some of the aviation gasoline cases) after termination of the lease, and is not effective if the lease is canceled for lessee's fault.
3. As option price DPC will receive cost plus interest, less rentals plus interest, or cost less specified depreciation, whichever brings DPC the most money, with a specified residual value. The depreciation rates are generally stated at 5 per cent for buildings, 12 per cent for machinery and 25 per cent for portable durable tools. The residual value varies from 15 per cent to 35 per cent.

In addition to the concern as to the effect of option and first refusal provisions, attention should be focused upon negotiation alternatives for disposition. We should not wait to see how many plants might be acquired



under the option provisions and then, having found that many plants were not acquired under those rights, set about to work up alternative terms and methods for disposal. Some of these alternatives might be worked out along the following lines. (1) Fixed prices — long-term purchase terms. (2) Sliding scale purchase plan. (3) Leasing arrangements on fixed and variable bases. (4) Lease with option to purchase. (5) Sale or lease of partial facilities.

Finally, it would appear that a clear over-all Congressional policy should be established so that executive agencies in control of plants as well as industry generally, should have some clear ideas as to the terms and conditions under which plants and facilities may be acquired through purchase or lease.

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Chromium and Nickel Actions More Evidence of Metals Relaxations

Washington

• • • Further indications of the growing easiness in the metals situations were reflected in the action of WPB last Friday in lifting all restrictions on the use of chromium and nickel in the manufacture of valves for the new engines that will go into the expanded 1944 truck production program and in removing restrictions on the use of copper and copper base alloy in renewable electric fuses and electrical wiring devices.

Lifting of the ban on chromium and nickel for making truck engine valves was included in an amendment to L-128. The action, it was said, is designed specifically to facilitate the output of these valves and does not lift restrictions on the use of these metals for replacement parts production.

In removing restrictions on the use of copper and copper base alloy in renewable electric fuses and wiring devices, WPB pointed out that steel had been used in the manufacture of these products under L-161 and L-277 since issuance of the orders in August, 1942 and April, 1943, respectively.

The return to permitted use of copper and copper base alloy, effected by amended versions of both orders, WPB said, will result in a considerable saving in man-hours, increased production, and more satisfactory products. Production of electric fuses has been seriously curtailed by the additional screw machine time required to process steel, and by the difficulty in obtaining prompt deliveries of steel rod. Wiring devices made from steel corrode after a few week's use, it has been found, and become inoperative.

Control over the distribution of the products remains unchanged, except that a rating of AA-5 or higher is required instead of a rating of A-1-J. This change is made to conform with over-all changes in the rating structure.

Non-renewable fuses are still subject to the restrictions on the use of copper and copper base alloy.

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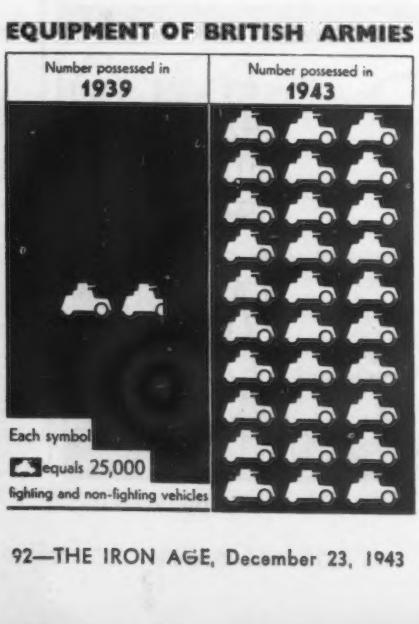
Iridium Relaxed, Reports Eased, Uses Expanded

Washington

• • • WPB last Saturday issued Order M-49, as amended, affecting three changes in the original order. The first change exempts persons using five oz. or less of iridium a month from the need to secure allocation authorization, but does not affect use restriction on this amount. The second provides for the discontinuance of reports by persons who have less than 10 oz. of iridium in inventory and who use less than five oz. in one month. The third change provides two new additional uses permitted for iridium under the order. The total amount of metal involved in these changes will be small, but it is expected that many appeals will be eliminated.

EQUIPMENT OF BRITISH ARMIES



Steel Reporting Further Reduced

Washington

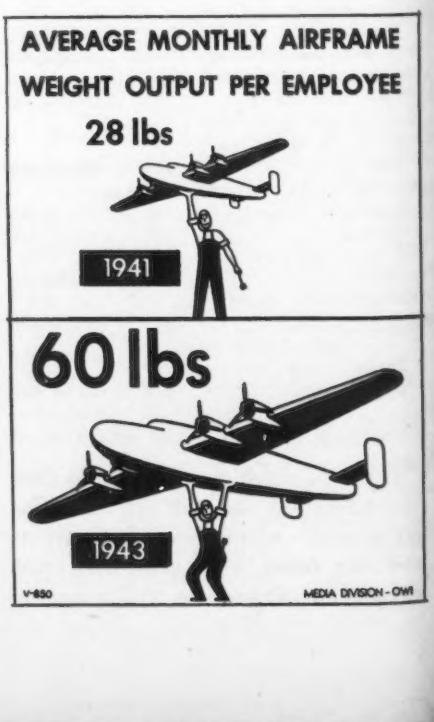
• • • WPB is now advising steel producers that the semi-monthly Producer's Report of Lend-Lease Iron and Steel Shipments and Forecast (WPB 2776) will not need to be filed after the report for the period ending Dec. 31.

The CMP plan is reported working so efficiently that Lend-Lease shipments have been going forward promptly and that further shipments are expected to continue on regular schedule without the formality of reporting to WPB. Reporting on this form was consequently asked discontinued.

Copper Released for Simplified Builders Hardware

Washington

• • • WPB last week released approximately 3,000,000 lb. of fabricated copper and copper base alloy parts for use in the manufacture of builders' finishing hardware, cabinet locks and padlocks. Action is taken through issuance of an amended version of Schedule I of Order L-236 which permits the use of such fabricated parts as are held in inventory on Nov. 30, 1943 (date of issue). Such parts, however, may be used only for items conforming to the simplified practices established by the Schedule.



Decentralization and Simplification Of CMP to Aid Small Class B Producer

New York

• • • **An almost completely** new Controlled Materials Plan for small users has evolved out of the decentralization and simplification of CMP. Simplification of CMP was started when it was learned that 15 per cent of all CMP-4-B applications (allocation applications) accounted for 90 per cent of all steel requirements and that the remaining 85 per cent of the applications consumed only about 10 per cent of the steel. This same factor led to the decentralization of application processing into field offices so that the 85 per cent of the paperwork volume could be handled mainly by the widespread field staffs instead of Washington. Permitting annual allocations on CMP-4-B, instead of quarterly allotments for small users, immediately reduced paperwork by 75 per cent.

Beginning Jan. 1, companies operating on the CMP, and making Class B products, will be classified by WPB in Washington as "small" or "large" cases.

On applications to be filed on Form CMP 4B for the first and subsequent quarters of 1944, those companies which use substantial quantities of controlled materials, will be considered as "large cases" and will receive allotments from Washington.

Manufacturers who use small amounts of controlled materials, however, will have their application file transferred to local district offices after basic allotments have been made in Washington. If your company is in the "small case" category, you will receive a notice from your district office. In that event, you should thereafter deal directly with the district office when requesting additional allotments or returning excess allotments.

"Small" companies are defined as those which are allotted controlled materials in amounts less than the following:

150 tons carbon steel; 40 tons alloy steel; 8000 lb. copper base alloy, sheet and strip; 10,000 lb. copper base alloy, rod, bar and wire; 5000 lb. copper base alloy, tubing and pipe; 10,000 lb. brass mill copper products; 15,000 lb. wire mill copper products; 30,000 lb. copper and copper base alloy foundry products; 7000 lb. aluminum, all shapes.

If the allotment in any one class exceeds these "ceilings" the application is classified as a "large case" and will continue to be handled through the Industry Division in Washington.

Biggest savings in paperwork will come from the handling of CMP-4B applications for small users on an annual basis. Second, third and fourth quarter 1944 allocations will be advanced on the basis of the first quarter application and this same policy may extend into 1945. While this phase is handled from Washington the labor is reduced to one application and a few screenings.

Interim or supplementary applications for small users, however, will be handled by the field offices. Washington is sending the case files of all small users to their respective district office and is establishing a "bank fund" of allocatable materials with each regional office which in turn is supplying the district offices. All future applications for interim allocations from certified "small" Class B producers will be accepted and processed by the local district office. The office allocates from its own reserves of controlled materials and maintains balance with the regional office.

Only familiar forms are used in the new plan. Increased allotments will use form CMPL 150 and CMPL 200 when dealing with Washington but only CMPL 200 when dealing with the district offices. Return of allotments will be made on Form CMP-32 and allotment reductions on Form CMPL-201. The manufacturer certified as a small user by WPB should remember, however, that all increases and returns of allocations should be made with his local office.

Increased allotments due to program changes in Washington (CMPL-200) will be returned to the manufacturer from Washington through the field office. Allotments on new applications (CMPL-150) will go direct to the manufacturer with only a copy to the field office for records.

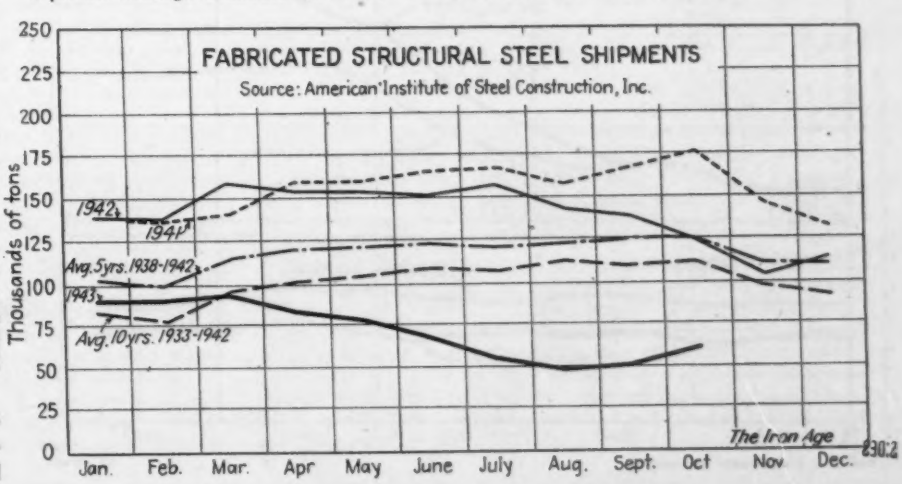
Small repair shops under certain provisions are no longer required to file CMP-4B's and need only to use the symbol V-3 on purchase orders for materials.

Result of the new plan is to reduce CMP-4B applications by 60 per cent —from 210,000 to 80,000 annually— and place 50,000 or over 60 per cent of these in field offices to handle.

WPB Requires Non-Destructive Testing

• • • **WPB has issued** Schedule 12 of Limitation Order L-211, as amended, providing that all steel heat exchanger, condenser, evaporator and similar tubes be hydrostatically or non-destructive tested hereafter.

. . . The present volume of fabricated structural steel for construction purposes is so small and the conditions are so unusual that the American Institute of Steel Construction, Inc., has decided to discontinue estimating the total bookings and shipments for the *industry* as heretofore, and its releases hereafter, until further notice, will be confined to a statement of facts as reported by participating members from month to month. The bookings of fabricated structural steel for bridge and building construction only for October, 1943, totaled 55,437 tons as compared with 60,980 tons for the preceding month and 40,044 tons for the corresponding month last year. Shipments totaled 62,014 tons as compared with 123,896 tons shipped in the same month last year. The reported tonnage available for future fabrication Oct. 30 was 273,981 tons.



Warehouses Considering Problem of Redistributed Steel Flooding Market

Cleveland

• • • **While it is difficult** for the individual warehouse to trace business lost because of the direction by redistribution agencies into open markets of excess stocks of steel created by cutbacks and cancellations of various armament programs, warehouse people generally are giving much thought to this possible threat to future business. Various estimates place the steel expected to be available nationally during the latter part of 1944 from excess stocks between 10,000,000 and 30,000,000 tons, a quite sizeable amount to be dumped on the market. While much of this accumulated material will not be re-salable because it is specific purpose steel, there will still be a sufficient amount to upset warehouse and jobber markets.

There is not more than a general indication of an upset in warehousing yet. The only known instances are in a few localities where specific products are having difficulty bringing ceiling prices. Warehouse inventories have never become excessive, mainly because of the difficulty in replacing stocks that are sold and also because of WPB inventory limitations. Even today warehouse orders to mills on such items as sheets and bars come back ticketed for delivery in June or July, 1944.

However, in the WPB fifth region alone present estimates of idle steel stocks are placed between 1,000,000 and 2,000,000 tons.

On the other hand, Army cutbacks in the steel business and allied industries are expected to total $10,000,000,000 spread over the next three or four years. This of course will not be totally cancellations of orders, much of it resulting from taking the shears to ordnance and service manufacturing plans.

Several points are brought out by warehouse people as probabilities if excess stock accumulations pile up at the expected rate. Currently, through various government agencies there is considerable steel being dumped on the market. These agencies represent the Army, Navy, WPB, and various other claimant agencies and do not necessarily restrict themselves to one agency per service. For example, there are four or five agencies representing the Navy that are handling the disposal of excess stocks, frequently without a clear knowledge of what each other is doing. This will likely continue and increase as time goes on and creates considerable confusion.

Second, the pressure that will result from such quantities of material being released to open markets may permit the organization of innumerable new jobber and broker organizations that, in many instances, may possibly be able to operate outside of the current restrictions placed on present warehousing organizations. This will immediately lead to the third point, price cutting, and price cutting will inevitably lead to a general breakdown of the whole warehouse price structure and an upsetting of all normal warehousing practices. Warehousemen do expect a bad situation to occur in about another eight months or a year.

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Steel Cartridge Order Going to Brass

Toledo

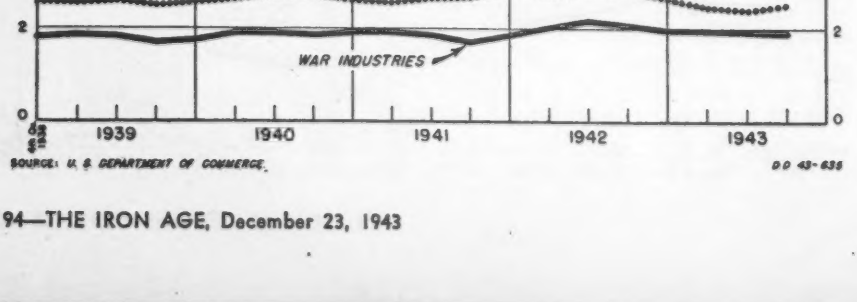
• • • **With the balance** of an order for 20 mm. steel cartridge cases going into the final finishing stages, the Dura Division of Detroit Harvester Co., at Toledo, will complete this steel case work within the next two weeks. Other producers throughout the country have already completed orders for this type of case. The Dura production lines already are being converted over to brass case manufacture, with the initial cup forming and drawing presses being in production.

About a dozen companies have been engaged in 20 mm. steel case manufacture for the past nine months, but when brass became more immediately available the Army began cancelling orders for the steel cases. Practically all of the steel case producers were cut out completely, while the remaining few were given orders for brass cases.

It is believed that the Dura Division was the only plant in which the orders for the brass case were equal in volume to the original orders for the steel cases. Close to 30 per cent of all steel cases manufactured were produced by Dura.

Dura has been working on a "round the clock" schedule but with the brass case order it is quite likely that some reduction in working hours can be made. It is figured that to maintain the same production in brass that was effected in steel case manufacture, a cut of about 20 per cent in operations will be made. In other words, there is about 20 per cent differential favoring brass case production over steel case output.

MANUFACTURERS' INVENTORIES AT END OF MONTH



NWLB to Be "On the Spot" With Steel Wage Demands; Back Wage Clause Fought

Pittsburgh

• • • **The much battered,** beleaguered and over worked National War Labor Board which must still wrestle with the latest coal contract is expected to have another sizzler handed to it within the next few weeks in the form of steel labor demands.

The WLB is the only governmental agency that has learned "that being on the spot" or "behind the eight ball" is just every day business in this fight for more wages but no inflation.

Phil Murray, CIO and steel union head, placed the first "eight ball" for WLB when he demanded that any steel company that did not agree to an extension of contract with a retroactive date to Jan. 3 should be ordered to do so. Hardly had this application been digested when Benjamin F. Fairless, U. S. Steel head demanded or rather quietly insisted that the board issue no orders that a retroactive date be set if a wage agreement calling for increase was finally arrived at.

As reported last week, Mr. Fairless also held that not only would such a date mean loss of money to his companies but costs were already sufficiently advanced that "they are already faced with the need to consider the necessity of seeking price relief because of existing costs." THE IRON AGE pointed out last week that the question of extension of contracts with retroactive dates was already a stumbling block in the initial stages of the steel-union conferences.

Meetings generally were adjourned last week to be reconvened Monday of this week. Continuation of such meetings, however, in view of last week's actions by the union and Steel Corporation is believed merely to be only "for the record."

Some steel companies have made counter proposals to the union involving union responsibility for "quickies" and so-called outlaw strikes. It is believed that the question of maintenance of membership and checkoff was brought up by one company on the basis that the union has not shown enough control of its members to warrant this privilege. It is believed also that at one meeting the possibility of the union bearing the cost of unauthorized shutdowns was discussed. All of these counter proposals will be turned down by the union as a matter of course. A stalemate probably will be reached this week.

Steel companies are not expected to agree to the union wage demands or to any proposals which will increase hourly wage costs. Since the majority of the demands are in this category there is little left to "maul over." It is believed that this will be made clear this week or next with the result that WLB will not only have the retroactive angle to decide on but must make a decision on the various wage demands.

Meanwhile, if the board does not take action one way or the other on the retroactive stumbling block before present contracts expire most observers here look for an avalanche of "unauthorized" strikes. There already has been an increase in flash stoppages in the steel industry. There is no reason to believe, according to quarters here, there will not be a far greater number if the present contracts expire without clearcut decision. They can only come from the WLB since both the union and the steel companies are looking to that agency for direction.

While some labor chieftains may look askance at the statement or inferences that many steel companies would be forced into the red in case of a wage increase and more importantly while some companies may reach that point by the first quarter of 1944 without any wage increase costs, market reports more than bear out some of this outlook. The product mix has changed so fast that some companies having lost some more profitable tonnage due to cutbacks have had an increase in the items that are not in some cases even reasonably profitable. There are in addition to this many times that have never been "good" ones and as many more that had had to have help from other steel products to help out on the profit side.

Strikes, slowdowns or "flashies" will also raise manufacturing costs as was indicated last week when National Tube Co. was forced to take down its blast furnaces and open hearths because two men refused to submit to downgrading when such action has

U. S. Steel OK's Contract Extension; Fights Back Wages

• • • Benjamin F. Fairless, president of United States Steel Corp., disclosed that the Corporation is willing to extend existing labor contracts beyond their present date of expiration during current negotiations between United States Steel's manufacturing subsidiaries and United Steelworkers of America (CIO) but expressed strong opposition to a retroactive clause in any wage adjustments which may result from these negotiations. Mr. Fairless' position was stated in the release today of the pertinent portions of a letter sent by him to William H. Davis, chairman of the National War Labor Board, in reply to a petition recently filed by the union with WLB.

In this petition, the union requested that the Board issue an order directing that any company which does not voluntarily sign an extension contract in the form proposed by the union shall be required by the Board to execute an extension contract, providing for the continuation of its present labor contract beyond the expiration date, with the specific provision that any modification or wage adjustment mutually agreed upon or directed by the WLB shall be retroactive to present expiration date.

Explaining that fundamental factors, beyond the power of the corporation to control or change to any appreciable extent, make it impossible for the subsidiary companies voluntarily to consent to the retroactive provision, Mr. Fairless continued: "We believe that the same factors should control your action, and that accordingly that part of the request of the Union for such a retroactive provision should be promptly denied by your Board as contrary to the national interest in time of war. Certainly, it cannot be the policy of your Board to take action which may threaten the financial ability of our steel-making and fabricating subsidiaries satisfactorily to perform their essential functions in providing steel so vitally needed for the winning of the war. Frankly, these subsidiaries are financially unable to absorb further increases in costs of any consequence. They are already faced with the need to consider the necessity of seeking price relief because of existing increased costs."

Mr. Fairless said that the nature of the steel business is such that producers of steel cannot go back to their commercial customers and expect them to pay increased prices for steel already delivered.

Mr. Fairless called attention to the fact that despite substantial increases in costs since Jan. 1, 1941, these subsidiaries' prices for major steel products are today the same as the published prices of 1939, a ceiling at this level having been established by the OPA in April, 1941.

The letter to Mr. Davis pointed out that between Jan. 1, 1941, and Oct. 31, 1943, the basic common labor rate applicable to the employees of most of these U. S. Steel Subsidiaries had increased from 62½c. to 78c. an hour, an advance of nearly 25 per cent; average hourly earnings of all wage earners in these subsidiaries had increased from $0.853 to $1.159 an hour, an advance of 35.9 per cent; and average weekly earnings of all such wage earners had increased from $33.01 to $50.42 per week, an advance of 52.7 per cent, partly occasioned by overtime pay.

been agreed upon previously by the union. The talk of early victory which the steel companies have not fostered and which union heads likewise have not countenanced has led to some changes in the thinking of the average steel worker. That word was average. He sees shutdowns, hears rumors of early victory and is all the more susceptible to hot-head strike talk.

Unless there is action soon from the WLB towards a decision on the retroactive question there will be an increase in the number of "steel labor troubles." As for the wage demands, the longer it takes to settle these the more chance there will be for interruptions of steel output by so-called outlaw strikes.

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Suggestions from Battle, Radioed to U.S.,

Cleveland

• • • **In Italy,** as beaten Nazi armies retreat northward, Army ordnance engineers follow on the heels of our allied armored units noting any change that will contribute to ultimate invincibility. Often suggestions come from battle — wise tank crews, men who have weathered enemy firepower and have ideas that may easily turn the tide of tomorrow's battle. These improvements are radioed to the United States and tank arsenals all over the country incorporate them into tanks that will be on the way to combat in a week.

Changes so sweeping as to call for complete redesign have come through and been put into effect immediately. No detail is too small if it contributes to the safety and comfort of the soldier. Some of these things are military secrets, and all of them have done a great deal to blast the Germans backward.

A few of the more recent changes were—armor has been increased in thickness to withstand heavier shell fire, and additional armor plate has been welded on the outside of upper hulls. An insulated accelerator pedal has been added to alleviate driver foot-fatigue, and tank clutch pedals now have guards on them to prevent drivers from catching the toes of their shoes in the rest of the mechanism. A new heavy section turret was developed by welding more armor on the side of the cast turret and provides much added protection for the turret gunner. This spot was found vulnerable to heavy caliber guns, and was strengthened by the addition of armor welded to the weak spots.

Indirect vision has replaced direct vision on the upper hulls to eliminate bullet splatter on the interior of the vehicle. An azimuth indicator has been installed to direct and maintain more accurate fire control. A new telescopic sight and sight mount have been recently added, further increasing accuracy of tank weapons.

Many Are Stricken As Induction Nears

Buffalo

• • • "Draft board backache" is the newest war ill to appear in the Buffalo district according to the Niagara Frontier Academy of Industrial Physicians.

"Symptoms appear as a man's induction date nears," one of the doctors explained "The patient grows worse until finally he breaks down and asks for a note from the plant doctor to his draft board. He doesn't get the note!"

Back strain is the cause of more lost time in industry than any other ailment, said another academician.

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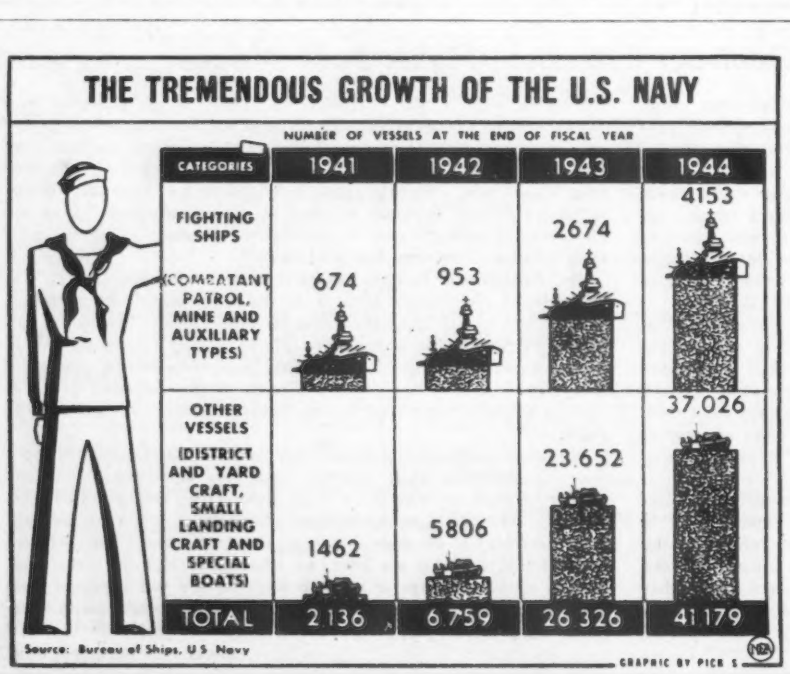
2,000,000 Tons of Ore Moved by All-Rail

Cleveland

• • • **With the** vessel movement of Lake Superior iron ore ended the total lake movement being 84,404,852 gross tons, it is estimated another 2,000,000 tons were moved via all-rail to consumers in the upper lake areas such as American Steel & Wire at Duluth and the Zenith Furnace division of Interlake Iron Corp., at West Duluth.

Lake Superior mines already are being organized for the winter program of preparation for 1944 shipments. Underground mines will continue operations. Overburden will be removed from some areas for the open pit operations next summer. The program also includes the installation of new surface machinery and repairs on old equipment, and docks and railroad cars will be overhauled.

Reports from Duluth indicate that about 12 of the giant locomotives of the Duluth, Missabe & Iron Range Railway Co. left that region immediately after the ore season closed, for winter duty on roads in the west and southwest.



Instrument Relaxation Asked

• • • **Discontinuance of** scheduling for the production of differential type flow meters and combustion controls was recommended at a meeting of the Differential Type Flow Meter Industry Advisory Committee with War Production Board representatives in Washington, WPB reports.

Maritime's Shorter Week and "Vigorous" Workers Pose Steel Quota Mystery to WPB

Washington

• • • **The steel demands** of the Maritime Commission have become more mystifying than ever before to WPB, particularly now since Admiral Vickery has ordered Maritime yards on a six-day week.

The Maritime Commission has told WPB that now it needs more, not less steel, because it is working a shorter week. It is possible that the scheduled increase of plates to the Commission to nearly 600,000 tons monthly by the new troop transport program accounts for the greater demand. But no one at WPB can understand why working a six-day week should not reduce Maritime's monthly demand by about 85,000 tons. But it has not.

Maritime's rather unsubtle explanation is that since the workers have a day of rest, they will be able to work with increased vigor.

WPB hopes plate production in the first quarter will be 3,355,000 tons, but despite this probable record-breaking output the plate supply will remain tight according to Steel Division officials.

Another complication in the flat rolled picture is the fact that the Army is giving serious consideration to the use of steel in ammunition boxes which have heretofore been made of wood or some composition. This will require additional sheet tonnage.

Although the decision on ammunition boxes has not been made solid, it is predicted that some excess steel capacity will be taken up in the next few months by relaxing substitution orders of this nature.

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Nelson Reveals Study of L Orders; Says Many Factors Limit Civilian Output

• • • **With shifts** in the military program creating a number of changes in the steel supply picture, WPB Chairman Donald M. Nelson last Friday revealed that WPB is making a study of all limitation orders so that unnecessary restrictions on civilian production may be relaxed as quickly as it is found feasible to do so. This came as an anti-climax. (THE IRON AGE, Aug. 5, page 80.)

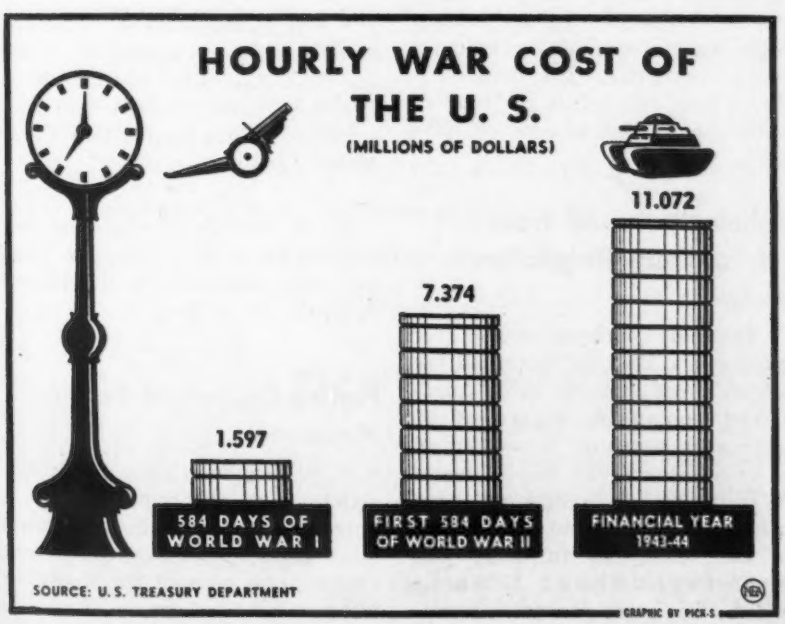
He emphasized that this does not necessarily mean any substantial increases in the production of consumer goods in the immediate future. The availability of steel is only one of a number of factors which limit civilian production, and the fact that the supply of some kinds of steel is easing does not necessarily mean that existing restrictions on the manufacture of goods made from those kinds of steel can be lifted. Component shortages will be a large factor.

Mr. Nelson said:

"The over-all demand for steel to meet the war production program continues strong, and steel products are still in short supply. Current operations in the steel industry are at 99 per cent of capacity, and it is expected that currently authorized first quarter programs will require from 95 to 100 per cent of steel capacity.

"The war demand for flat rolled steel products, including plates, sheets, strip and tinplate, continues to exceed supply.

"The demand for certain other types of steel products, including structural shapes, alloy steel bars and some wire products, has eased," Mr. Nelson added. "It may presently be possible to make some of these products available for increased civilian use."



"E" Awards Granted To 5,664,000 Workers

• • • The astonishing total of 5,664,000 workers, employed in 2415 war plants, have received Army and Navy "E" awards for excellence of production since Pearl Harbor the American Federation of Labor which obtained the official figures from the War and Navy Departments announced on Monday.

The War Department stated its awards had gone to 1590 plants employing 3,864,000 workers up to Dec. 1. The Navy Department, after allowing for duplications with Army awards, said its net totals were 825 plants with 1,800,000 workers.

Wilson Orders Review Of Plant Expansion Programs

Washington

• • • **WPB Executive** Vice Chairman C. E. Wilson has ordered WPB Industry Divisions to review the Facilities Programs with the idea of reporting by Jan. 15 on what plant expansion can be stopped. The limitation on plants to be reported as feasible to discontinue construction on is $100,000.

Purchasing Rules for Excess Steel Outlined

New York

• • • **Much has been said** yet too little seems to be known, according to WPB, regarding the rules and regulations controlling the purchasing of idle and excess steel stocks. As a general guide to the problem the New York regional office of the WPB has outlined the following broad rules:

Idle and excess steel may be purchased by accredited warehouses in any quantity without ratings or allocation and without affecting the individual warehouse's quota. The steel, however, must clear through the Redistribution Branch of regional WPB offices.

Dealers and distributors who have no quotas are permitted to purchase idle or excess steel so long as the items purchased are the same as those which the firm regularly stocks and sells.

Steel consumers can purchase from idle and excess stocks through the Redistribution Branch by obtaining an auxiliary allocation on Form CMP-4-B or on CMP-4 in amounts up to 20,000 lb. per quarter.

Producers of civilian articles may purchase allowable items (those not important to the war effort) through a special appeals procedure clearing through the Redistribution Branch.

Idle or excess fabricated articles or components after being listed with the Redistribution Branch may be purchased by distributors or wholesalers who certify that they are regularly engaged in the sale of the specific articles. These are materials other than those listed as "industrial materials" in Priorities Reg. 13 or subject to Directive 16, covering aircraft materials.

Aircraft inventories must first have the approval of the Aircraft Scheduling Unit or Aircraft Resources Control Office before transfer is permitted.

Rejected military material is not covered by above rulings.

o o o

Freight Car Castings Prices Extended to Jan. 15

Washington

• • • **The adjustable pricing** provision which has been in effect for miscellaneous freight car castings is continued and is effective until a price adjustment is made by OPA or until Jan. 15, 1944. This is contained in Amendment 2 to Revised Order 19 under Revised Price Schedule No. 41.

The provision allows producers to deliver or agree to deliver these castings at prices to be adjusted in accordance with action, if any, which is taken by OPA after delivery and prior to Jan. 15. However, producers may not receive, nor buyers pay, an amount which exceeds the maximum price in effect at time of delivery, unless action is taken by OPA.

The amendment extends the provision from Dec. 15 to Jan. 15 to give OPA time to analyze and promulgate prices in accordance with its findings and the suggestions of the industry advisory committee. The decision is expected soon and before the limit of Jan. 15. This action became effective Dec. 15.

•

Loophole Removed from Steel Furniture Regulation

Washington

• • • **To assure continued** control over production and distribution of all the restricted types of metal office furniture and equipment, regardless of whether such furniture is used in an office or elsewhere, the words "metal office furniture and equipment" have been changed by WPB to read "metal office and industrial furniture and fixtures" throughout L-13-a as amended. The same change in terminology has been made in the reference to L-13-a in Schedule B of L-260, covering all types of furniture. A few other changes, affecting metal tool cases, time card racks, inventory reports and the language of the order, have also been made in L-13-a.

•

Ceiling Lowered on Aluminum Scrap, Some Ingot

Washington

• • • **OPA on Saturday** reduced the ceilings on aluminum scrap and secondary ingot at the producers level by approximately 1½c. lb. bringing the new ceiling to 12½c. lb. It was stated that this would not appreciably affect market prices as these products have been selling at or below the new ceiling level for some time. The changes were made through Amendment No. 2 to MPR 2 effective Dec. 23.

•

Idle Welding Equipment No Longer Required Listed

Washington

• • • **WPB last Thursday** relaxed its regulations requiring all owners of idle used resistance welding equipment to register any such equipment with the board. Hereafter, owners need register such used equipment only on specific requests from WPB, on Form WPB-4732, in accordance with instructions accompanying the request. This modification is contained in an amendment to L-298.

L. R. Boulware Named WPB Vice Chairman of Operations

• • • **L. R. Boulware** is the new WPB vice-chairman of operations, succeeding H. G. Batcheller who quit Nov. 23. Boulware, former deputy controller of shipbuilding has been with WPB since March 1942.

•

W. B. Murphy is the new deputy vice-chairman for production. Murphy has been chairman of the industrial facilities committee.

Plating Equipment Eased

Washington

• • • **WPB last Thursday** lifted restrictions on the acquisition of electroplating and anodizing equipment to allow users to obtain needed spare or repair parts without the necessity of filing a PD-1A form as in the past.

•

Army Turns "Indian" On Scrap Gun Dealer

Washington

• • • **The career of a Philadelphia scrap dealer in the munitions business was cut off sharply by the Army recently, a WPB official says.**

The War Department seized 10 tons of World War I machine guns which had been purchased from the Army by the dealer at 3c. a lb. The reason the War Department turned "Indian" was that the guns were not broken up when sold, and the dealer was able to resell them to unauthorized persons as used machine guns.

While the War Department is reported to have reimbursed the dealer for the scrap price of the guns, it is said that the company will file suit in the Court of Claims for $12,000.

SKILLS SHARPENED

★ American industry is today meeting the necessities of wartime production with such vigor that the Allied output of war materials is three times the Axis output.

Here at Aluminum Industries, skills acquired through many years of pioneering development work and experience in casting aluminum and magnesium alloys have been sharpened and refined by the demands of war.

When the war is over, Aluminum Industries will be prepared to apply today's knowledge to tomorrow's possibilities, offering even finer products — even better service — to help industry serve a world at peace.

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LARGEST EXCLUSIVE BUILDERS OF COOLANT PUMPS

Two Steel Producers Granted Price Relief

New York

• • • **Two steel producers** were granted temporary price relief on steel products by OPA according to an announcement of last week.

The Kaiser Co., Oakland, Cal., was granted an increase of 55c. per 100 lb. on carbon steel plates making the new price $3.20 f.o.b. Pacific Ports. Customary switching charges and freight equalization within governing Pacific Ports were retained.

Sheffield Steel Corp., subsidiary of American Rolling Mill Co., is now permitted to charge $2.60 per 100 lb. f.o.b. St. Louis plant for tie plates, $2.55 per 100 lb. for structural shapes and $2.75 per 100 lb. for carbon steel merchant bars, f.o.b. St. Louis plant.

The Kaiser order became effective retroactive to Oct. 12 and the Sheffield order effective Sept. 20. OPA withheld release of the information until last week.

Roofing Makers May Use MRO to Obtain Nails

Washington

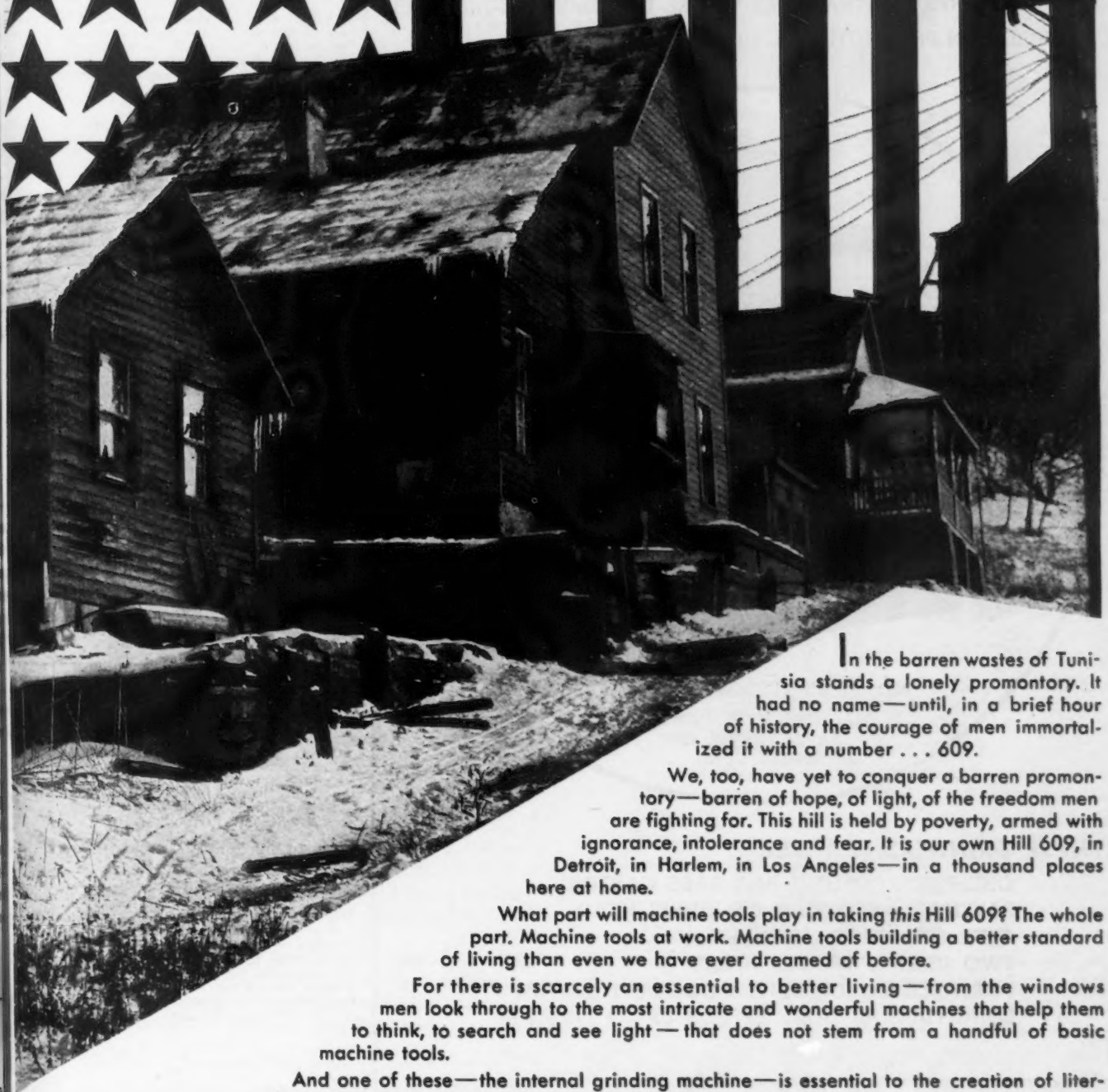
• • • **Manufacturers of asphalt shingles**, roll roofing and siding, asbestos shingles and siding, or cork board may use the MRO symbol to purchase steel nails to be delivered along with such products to be used in applying them, the WPB announced recently. All orders for such nails call for delivery to the manufacturers after Dec. 31, 1943. This ruling was contained in Direction No. 14 to CMP Regulation No. 5.

After Dec. 31, 1943, any manufacturer who can purchase his steel nail requirements under Direction No. 14 to CMP Regulation No. 5, must not get them under Order M-21-b-2 relating to steel warehouses and dealers or under any other order or regulation of WPB.

Milestones

• • • **Penn Metal Corp. of Penn**, Philadelphia, has issued a 32-page, illustrated booklet commemorating the 75th anniversary of the founding of the company. The booklet traces the history of the company from its founding in 1869 and also lists a number of patents taken out by the founder from 1879 to 1907.

What part will machine tools play in helping to take this HILL 609?



In the barren wastes of Tunisia stands a lonely promontory. It had no name—until, in a brief hour of history, the courage of men immortalized it with a number . . . 609.

We, too, have yet to conquer a barren promontory—barren of hope, of light, of the freedom men are fighting for. This hill is held by poverty, armed with ignorance, intolerance and fear. It is our own Hill 609, in Detroit, in Harlem, in Los Angeles—in a thousand places here at home.

What part will machine tools play in taking *this* Hill 609? The whole part. Machine tools at work. Machine tools building a better standard of living than even we have ever dreamed of before.

For there is scarcely an essential to better living—from the windows men look through to the most intricate and wonderful machines that help them to think, to search and see light—that does not stem from a handful of basic machine tools.

And one of these—the internal grinding machine—is essential to the creation of literally *everything* that will make for a better living after this war.

BRYANT CHUCKING GRINDER COMPANY SPRINGFIELD VERMONT, U.S.A.

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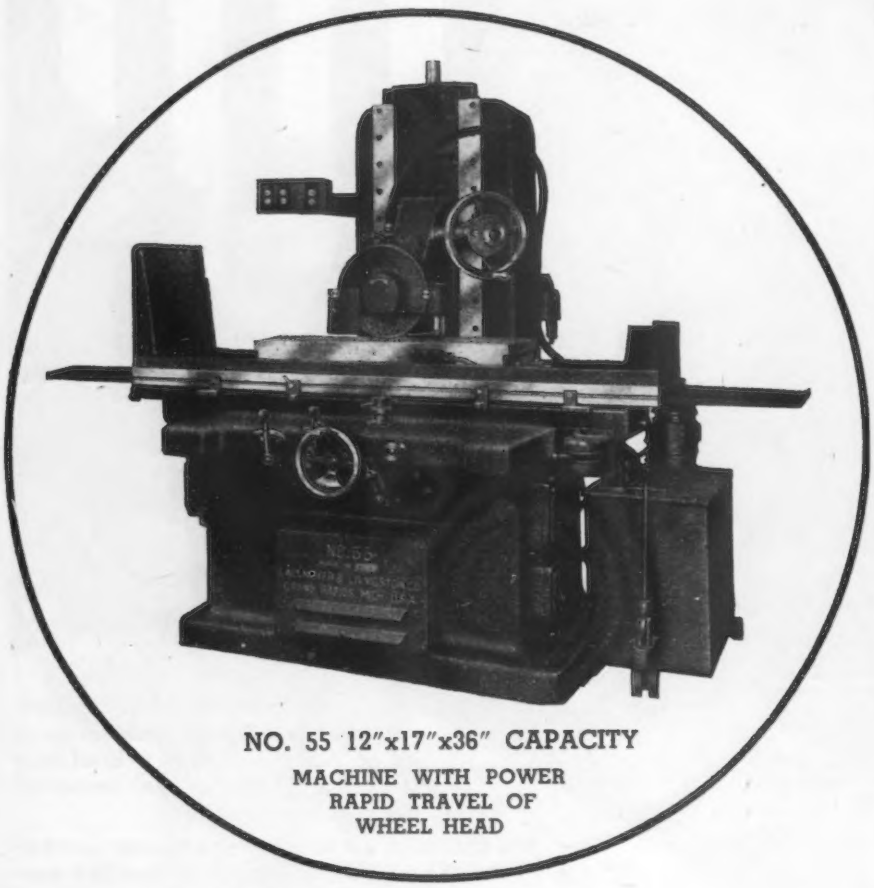
ARE MEETING THE MOST EXACTING NEEDS OF ARMY, NAVY AND AIR CORPS CONTRACTORS WHERE EXTREME ACCURACY IS REQUIRED ON PRODUCTION JOBS.



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MACHINE WITH POWER RAPID TRAVEL OF WHEEL HEAD

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ONE PIECE COLUMN AND BASE CASTING
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Priority Changes

L-91—Amended order removes all restrictions on distribution of used commercial laundry, dry cleaning, and tailors' pressing equipment. (12-15-43)

•

L-110—Amended order lifts restrictions on the acquisition of electroplating and anodizing equipment to allow users to obtain needed spare or repair parts without the necessity of filling a PD-1A form as in the past. (12-16-43)

•

L-192—Dir. 1 assigns automatic AA-1 preference ratings to the Foreign Economic Administration for repair parts needed to rebuild and recondition used construction equipment to be shipped overseas for use in strip coal mining. (12-13-43)

•

L-211—Sched. 12 provides that all steel heat exchanger, condenser, evaporator and similar tubes be hydrostatically or non-destructive tested hereafter. (12-13-43)

•

L-298—Amended order relaxes WPB regulations requiring all owners of idle used resistance welding equipment to register any such equipment with WPB. (12-15-43)

•

L-303—Order standardizes steel insect screen cloth, used for making and repairing window screens, screen doors and has established a policy of equitable distribution to meet essential civilian requirements. (12-14-43)

•

M-11-1—Amended order reduces the number of applications that will be required hereafter for zinc dust by increasing the volume by about 50 per cent of the product which may be purchased without authorization. (12-13-43)

•

M-160—Amended order provides for a quarterly instead of a monthly filing of applications for authorization to deliver or accept delivery of beryllium. (12-15-43)

•

M-319—Amended order increases the size of the exemption from authorization for small orders of abrasive grain with the exception of optical finishing powders, to 20,000 lb. in each two-month authorization period beginning Jan. 1, 1944. (12-15-43)

Price Briefs

• Amdt. 21 to Order A-1 of MPR 188 announces minor reductions in maximum prices of warm-air furnaces from which certain parts have been omitted by manufacturers in accordance with recent WPB limitation orders. (Release No. OPA-3675)

•

• MPR 113, as revised, provides a ceiling price of $4.45 per gross ton for standard Mesabi non-Bessemer iron ore produced in the Lake Superior district. (Release No. OPA-3663)

•

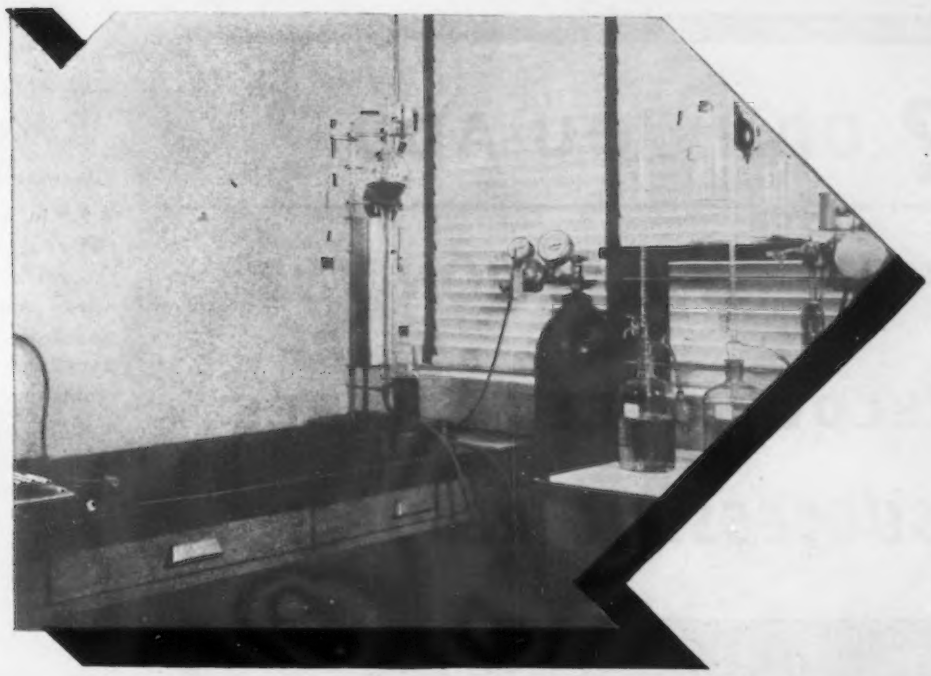
• Amdt. 2 to Revised Order 19 under RPS 41 provides that the adjustable pricing provision which has been in effect for miscellaneous freight car castings is continued and is effective until a price adjustment is made by the OPA or until Jan. 15, 1944.

•

Canada Lowers Tungsten

Ottawa

• • • **The Department** of Munitions and Supply announced that the order, under which the maximum price of tungsten scheelite ores produced in Canada was raised to $26.50 per unit of 20 lb., has been rescinded.



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Lindberg Laboratory furnaces, hot plates and control, modern in design, are engineered and built to meet the exacting everyday requirements of your laboratory.

Lindberg Combustion Tube Furnace—Temperatures to 2500° F. For fast modern volumetric as well as gravimetric types of determinations. Equipped with built-in transformer, all necessary control, Globar elements and tube adaptors.

Lindberg Box Furnaces—Temperatures to 2000° F. Expressly built for the many usual laboratory jobs, such as: ash determinations, fusions, etc. Equipped with heavy, low voltage, rod type elements. Built in two sizes with chambers 4½" x 10" x 4" and 7½" x 14" x 5½".

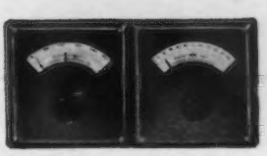
Lindberg Hot Plates—Temperatures to 900° F. These hot plates, available in three sizes, 10" x 12", 12" x 20" and 12" x 30", have special cast metal tops. Coiled nickel-chromium elements are placed to give uniform fast heating.

The Indicating Pyrometer and Input Control mounted in the same case provide the laboratory with "stepless" temperatures and embody the famous Lindberg "percent of current input" control.

Combustion Tube Furnace

Box Type Furnaces

Hot Plates



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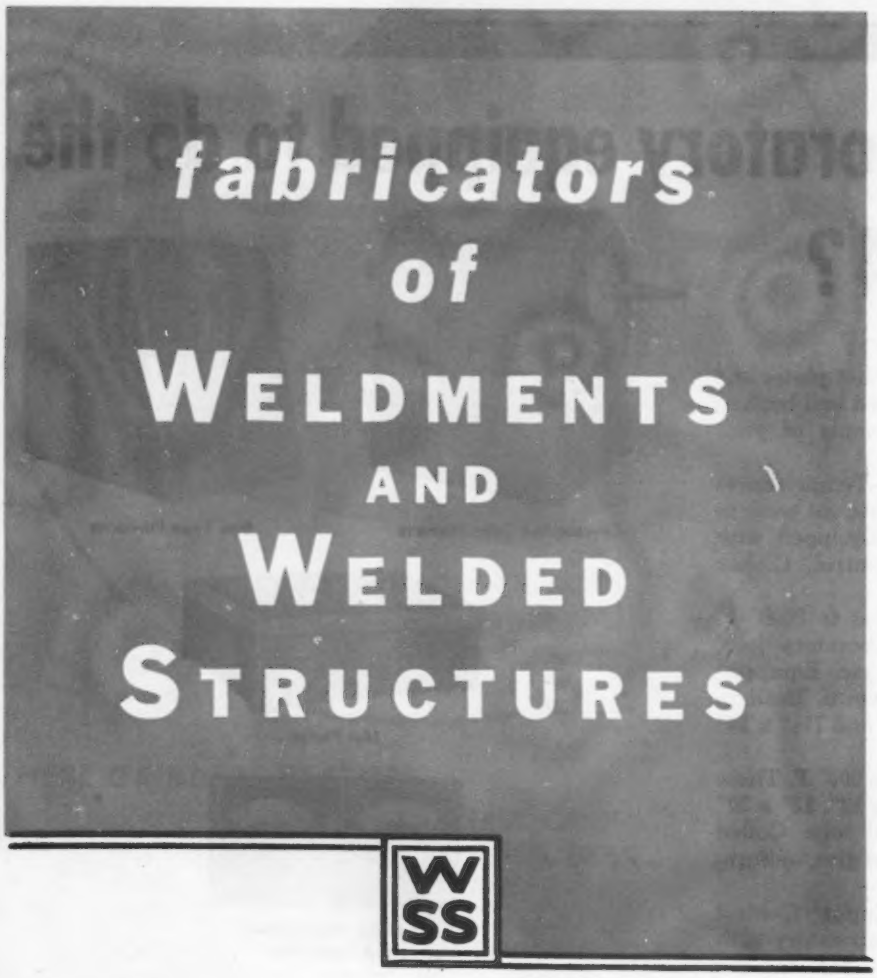


WSS

WELDED STEEL SHAPES
COATESVILLE, PA.

Export Sales from Warehouses Explained

Cleveland

• • • **In a report** received from the Office of Export-Import, OPA Price Control by the Steel Products Warehouse Association, three kinds of warehouse export sales are differentiated and the pricing provisions governing each type are explained.

When the warehouse acts as an exporter, selling material direct to a customer and not involving agents. The warehouse's maximum export prices are governed by section 8(b) of the Second Revised Maximum Price Regulation. The base price is the maximum domestic price, delivered f.o.b. inland carrier or f.a.s. vessel, within the warehouse's city or free delivery area. The export expenses that may be added are indicated in paragraphs 8(b)(1)(ii) and 8(b)(2)(iv). There is no requirement that the customer be quoted a delivered price. The export expenses referred to are listed as inland transportation charges (at export rates where applicable), demurrage, storage, transfer, to the export carrier, ocean or other export freight, marine and war risk insurance, and consular fees. These charges may be made only when the material has been put through the warehouse.

When a warehouse sells to an exporter for the exporter's own account. In this case the maximum delivered price applicable to any domestic customer at the exporter's location may be charged. To this might be added certain extra packing expenses if these are shown separately on the invoice.

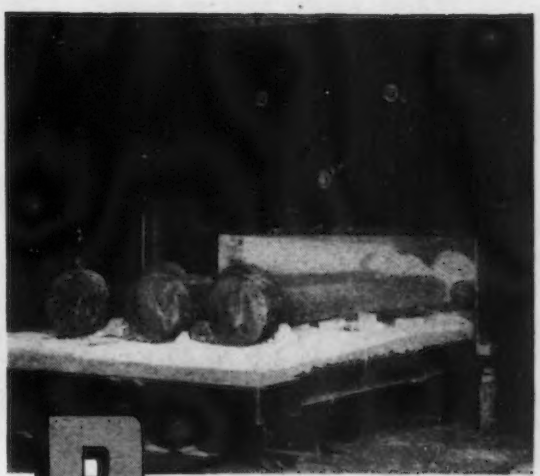
When a warehouse ships direct to the exporter's customer. Pricing on this type of order depends on whether the exporter or export agent is acting for himself or as the agent of a foreign buyer. If he is acting for himself, taking title and exporting for his own accounts, then he and not the warehouse is the exporter. Then, the transaction is a sale to an exporter and is priced at the maximum delivered price applicable to any domestic customer at the exporter's location. If, however, the exporter is acting as an agent, even though he takes title as such, then the price is computed as if the warehouse itself were the exporter.

HITTING THE BEACH
with Barium Steels

TO DRIVE its blunt nose firmly onto the beach and then pull its flat hull off the sands, the ATLC requires extra power . . . *and extra strength and toughness in the propeller shaft.*

This strength and toughness are proved in Barium Steel Propeller Shafts, due to *unified control* in manufacture. Every operation, from the first melt to the final lathe turn, is performed in one plant, under one management. This fact — and the all-important Barium *know-how* — have enabled Barium Steels to show outstanding performance in ATLC exacting service — and in many other hard-to-make parts for ships and ordnance for Victory...

We invite your inquiries for Die Blocks, Hammer Rods and Heavy Forgings.



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STAINLESS STEEL CORP.

Producers of Stainless, Alloy, and Carbon Steels **CANTON, OHIO**

The main job today is
...even with sturdy FORD
Triblocs

This is no time to abuse machinery. Because steel is so critical to America now, it is up to every one of us to make our present equipment last longer. That means proper maintenance. Here are a few simple things to do to keep your **FORD TRIBLOCS** in efficient working order:

- Keep equipment well lubricated and in good repair.
- Don't exceed rated capacity.
- Inspect chain periodically and lubricate to avoid excessive wear.
- Don't make lifts or pulls for which hoist was not designed or intended.
- Avoid dropping hoists or throwing chain about carelessly.
- Replace hooks when showing signs of distortion from overloading.
- Be sure the hoist has the capacity and characteristics necessary for the job.
- Proper hoist selection saves production time and lengthens hoist life.

Write for information on **FORD TRIBLOCS**. They range in capacities from ¼ ton to 40 tons. They are available to all who have adequate priority rating.

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AMERICAN CHAIN & CABLE COMPANY, Inc.
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Warehouse Quantity Differentials Clarified

Cleveland

• • • **In a convenient** summary form the Steel Products Warehouse Association has rounded up many of the questions it has received on how to figure quantity differentials.

Orders Under 40,000 lb.

In determining the quantity bracket applicable to a warehouse steel order priced under Appendix F (seconds) or Appendix G (zones), all orders of one day from one person for shipment at one time or at seller's convenience to one destination must be combined. *"One person"* is interpreted to include all persons acting for one company, provided that the payment of the invoices is made by one central accounting office. *"One destination"* shall include all destinations within a rail price area, within switching limits or free delivery areas applicable to the destination which is most inclusive.

If one order specifies delivery to several points, some of which are within the same rail price area within a free delivery area or switching limits and other destinations are in another rail price, switching limit, or free delivery area, the differential change. The quantity differential for the material delivered within the same rail price, free delivery, or switching limit area would be based on the total weight ordered for these points. The quantity differential for the other destinations, in a different rail price or free delivery area, would be based on the weight of material ordered for each of these destinations alone.

Shipments of 40,000 lb. or More

If the total weight of a warehouse order is 40,000 lb. or more, regardless of the number of destinations or the location of these destinations, the warehouse must get the Office of Price Administration to price it. This is true even if the material ordered for any one destination is less than 40,000 lb. If the total weight ordered is 40,000 lb. or more, pricing must always be done under the 40,000 lb. provisions contained in Revised Price Schedule 49, Appendix A, Section k(2), k(5).

Waste Wasters OK'd

• • • **Issued last Saturday** by WPB, Direction No. 1 to Conservation Order M-81 authorizes the substitution of tinplate waste-waste for frozen tinplate in cases where frozen tinplate is specified as a can material.

Alloy Steels—

BARS
BILLETS
COLD DRAWN

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War Bond Owners Are Stockholders in Victory

Add to Your Investment As Often As You Can

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● All the facilities and resources at Wisconsin Steel are keyed to one objective today—*the winning of the war.* Our steels are produced to meet exacting specifications.

If you have an alloy steel problem, we invite you to discuss it with us and to avail yourself of the services of our staff of skilled metallurgists. Our knowledge of alloy steels—and how a specific use or application may help you meet your wartime production schedule—is at your service.

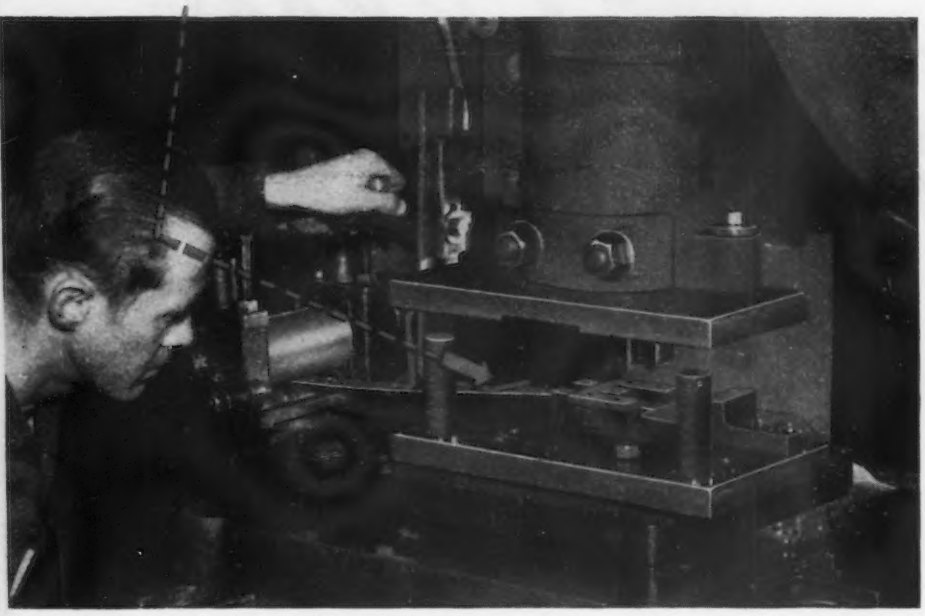
Wisconsin alloy steels meet every need. A record of QUALITY manufacture stands behind them as your assurance of user satisfaction.

WISCONSIN STEEL COMPANY

AFFILIATE OF INTERNATIONAL HARVESTER COMPANY

General Offices: 180 North Michigan Avenue **Chicago 1, Illinois**

STEEL—MOST VERSATILE OF METALS IS LIMITED ONLY BY MAN'S INGENUITY



Workman's Familiarity with Steel Fabricating Speeds Production . . . . . .

THE BROAD RANGE of desirable characteristics obtained by . . . combinations of chemical analysis . . . cold working . . . and heat treatment . . . makes steel the most versatile of metals. The steady growth in steel production is proof that engineers, designers, fabricators, and consumers are increasingly conscious of the many advantages steel offers.

Thomastrip offers a wide variety of the many refinements found in Cold Rolled Strip Steel—accurate gauge . . . finishes for painting or plating . . . uniform tempers ranging from dead soft to hard . . . special type edges . . . non-scalloping deep drawing quality . . . low and high carbon content . . . fine grain for special requirement . . . and a variety of non-ferrous and lacquered finishes. Thomastrip coated with zinc, copper, brass, nickel, solder or tin affords an ultimate finish for your product.

Many problems have been solved by the use of Thomas specialized cold rolled strip steel. Our engineers are at your service.

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THE THOMAS STEEL CO. · WARREN, OHIO

NEWS OF INDUSTRY

Steel Liners Permitted for Furnaces by Amended L-22

Washington

• • • **Carbon steel inner liners** for new furnaces installed to heat new buildings or additions to old buildings were permitted by WPB recently in an amendment to Order L-22.

The revised order also permits the manufacture of feed door smoke curtains, feed door inner liners, hot blast lift doors and upright shaker handles from cast iron.

The provision of L-22 which restricted sales of furnaces to orders carrying an A-10 or better preference rating has been eliminated. The amended order requires a monthly report from furnace manufacturers on Form WPB-3316 containing information concerning production, shipments, unfilled orders and estimated future production.

•

OPA Interprets Stainless Scrap Ruling

• • • **Maximum prices for all grades** of stainless steel scrap have been established by Revised Price Schedule No. 8. The prices as listed in the Schedule for stainless steel scrap containing both nickel and chrome apply only to carload quantities. For less-than-carload quantities, the Schedule provides that $10 per gross ton must be deducted from carload maximum prices. It is permissible, however, to obtain these carload maximum prices when segregated straight-chrome-type scrap has been included in making up a carload shipment. Maximum Prices for straight-chrome-type material, on the other hand, apply to both carload and less-than-carload quantities.

•

CMP Class A and B Lists To Be Published Monthly

• • • **The "Official CMP Class B Product List and Class A Civilian Type End Products List,"** issued May 15, 1943, will no longer be used, the WPB states. Its place will be taken by publication in "Products and Priorities" of the "Official CMP Product List," brought up to date monthly.

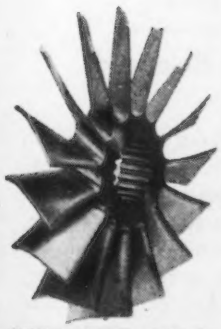
"Products and Priorities," issued each month by WPB, is available for reference at all offices of the board. Persons wishing copies for themselves may order from the Superintendent of Documents, GPO, Washington, D. C. Subscription rates are $2.00 per year; single copies, 20c.

"We could not, in honesty, acknowledge our pride on this occasion without paying a special and public tribute to our fellow employees. To a very major degree, this widely coveted and proudly possessed award now flies above the DeVlieg plant because of their loyalty, their devotion to the job at hand and to their uninterrupted effort. Although this honor comes from past achievement, it is proper to say here that another DeVlieg project now nearing completion will make possible another sensational step-up in the performance of still another type aviation engine."

Chas B. DeVlieg. H. R. DeVlieg E. P. DeVlieg

DEVLIEG

FERNDALE - - - MICHIGAN



SUPERCHARGER INDUCER BY DE VLIEG

The acceptance of the DeVlieg art by industrial America was originally based on the superiority of DeVlieg milling methods, and the "E" award was conferred for a revolutionary application of these basic methods. This new application involved the development of the process and the machines by which is being produced the inducer portion of *ALL* the superchargers of the Allison and Rolls Royce aviation engines. As a result of this one application of the DeVlieg art, both of these famous engines demonstrate importantly increased performance. At the same time, the inducers themselves are being produced at *FIVE PER CENT* of their original cost with a reduction in required machine tool investment of *NINETY PER CENT!* Today what formerly was a complex manufacturing operation calling for the highest type of veteran craftsmanship is now capable of being performed by women.

JIGMIL BY DE VLIEG

EUCLID CRANES

The Steel Improvement & Forge Co., Cleveland, early won the coveted Navy E for production excellence — a distinction well merited, as evidenced by the flood of materiel that steadily leaves this plant.

Here four EUCLID CRANES furnish *speed* to meet fast production schedules and *facility of movement* through precision control to handle a large variety of production operations. This simple control handles all movements over the entire floor area and can be operated by any workman.

WE CAN DELIVER
a limited number of
5 to 10 TON Cranes
in
60 to 90 Days

Other Euclid features include the finest type of anti-friction bearings, advanced lubrication—and easy facilities for inspection, adjustment or repairs.

THE EUCLID CRANE & HOIST CO.
1361 CHARDON RD., EUCLID, O.

Change in Warehouse Pricing Explained

Cleveland

• • • **Warehouses shipping** quantities of 15 to 20 tons have to compute prices in a new manner as the result of an official interpretation by the OPA. According to this interpretation, any savings on freight that may be obtained in cases where the minimum carload rate is lower than the LCL rate have to be passed on to the customer.

Published rail rates contain a statement to the effect that the charge for a less than carload shipment must not exceed the charge for a minimum carload at carload rates. When the LCL rate multiplied by the weight of the shipment would result in a larger charge than the carload rate multiplied by the minimum carload weight, the shipper is entitled to the lower charge and such savings must be passed along to the customer.

To figure the ceiling price under Revised Price Schedule No. 49, the price per 100 lb. must be determined. Therefore, when the total charge for a minimum carload shipment is determined, this must be divided by the actual shipment in order to get the rate per 100 lb.

In order to counterbalance absorption necessary on some types of shipments when the trucking rate is higher than the LCL rate, OPA permits the warehouse to make a few cents on certain types of shipments when the trucking rate is lower than the LCL rate.

For example, a warehouse ships to a destination to which the LCL rate is 35c. and the LTL rate is 25c. The warehouse may charge the LCL rate even if the shipment is made by truck. However, if the trucking rate is higher than the LCL rate, the warehouse must absorb the difference except when provision on dislocated tonnage, inter-zone shipments, or maximum freight absorption apply.

Scrap Bale Ties Released

Washington

• • • **Its purpose being** accomplished, WPB last Friday revoked Supplementary Order M-24-d which channeled all cotton bale tie scrap to the reworkers. The action was taken, WPB said, because of the heavy carryover of reworked ties, the short cotton crop and the need for scrap by steel producers. This revocation removes restrictions on the flow of scrap bale ties.

Follansbee for Steel

Sterling for Silver

What "Sterling" means to silver, the "Follansbee Smith" means to open hearth steel.

Ever since Madison was President, the Follansbee Steel Corporation and its predecessors have continuously enjoyed a reputation for quality. First it was as an importer of bar iron and tin plate, later as a steel producer. Products have changed. Methods have changed. But the policy of making products of the highest possible standard has remained constant.

Today, Follansbee's compact, highly skilled organization is continuing that reputation by its ability to produce quality steel to meet the specialized requirements of its customers. Look for "Sterling" on silver . . . look for the "Follansbee Smith" on steel.

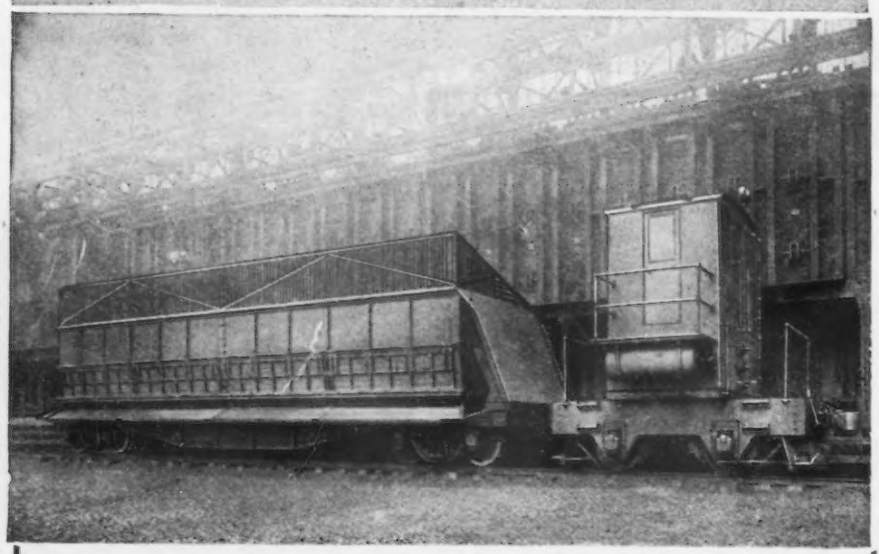
FOLLANSBEE STEEL CORPORATION

GENERAL OFFICES • PITTSBURGH 30, PA.

Sales Offices—New York, Rochester, Cleveland, Detroit, Milwaukee. *Sales Agents*—Chicago, St. Louis, Nashville, Los Angeles, Toronto and Montreal, Canada. *Plants*—Follansbee, W. Va. and Toronto, Ohio

ALLOY BLOOMS, BILLETS, BARS, SHEETS & STRIP
COLD ROLLED SHEETS & STRIP • POLISHED BLUE SHEETS • ELECTRICAL SHEETS & STRIP • SEAMLESS TERNE ROLL ROOFING

COKE OVEN EQUIPMENT



QUENCHING CARS AND LOCOMOTIVES

All Atlas Coke Oven Equipment is of heavy-duty construction permitting the peak operating conditions required in today's stepped-up production schedules. As a result of years of experience, Atlas is able to design and build equipment, to meet the requirements of each particular coke plant. Detailed information available on request.

Other ATLAS Products

Ore Transfer Cars

•

Scale Charging Cars

•

Electrically Operated Cars for Every Haulage Purpose

Locomotives for Switching and Interplant Haulage

•

Turntables

The ATLAS CAR & MFG. CO.

ENGINEERS MANUFACTURERS

1100 IVANHOE RD. CLEVELAND, OHIO, U. S. A.

Use of Employer's MRO Ratings Broadened

Washington

• • • **Procedures under** which employees may use their employers' MRO preference ratings if they are higher than AA-3 to purchase hand tools and safety equipment have been broadened in order that they may be used in connection with MRO ratings assigned under "P" and "U" orders as well as with ratings assigned under CMP Regulation 5 and 5A, WPB announced on Dec. 7.

At the same time, the scope of items to which the procedure is applicable has been broadened to include more things that an employer needs.

Provisions to encourage employers to permit their employees to use their ratings for the purchase of hand tools have been written into the regulation. The procedures, established under Direction 4 to Priorities Regulation 3, do not require that employers deduct their employees' tool purchase from their MRO quotas.

•

OPA Plumbing Advisory Committee Announces Meeting

Washington

• • • **Recently named by OPA** to serve on its Industry Advisory Committee on Plumbing Drainage Staples and Specialties, 10 industry officials will hold an organization meeting at OPA on Thursday of the present week.

Those named as members of he Committee are: L. C. Anderson, secretary-manager, Portland Iron Works, Portland, Ore.; N. L. Boosey, secretary-treasurer, Norman Boosey Mfg. Co., Detroit; Leo J. Filstead, secretary-treasurer, John C. Kupferle Foundry Co., St. Louis.; M. J. Hirshstein, vice-president, Josam Mfg. Co., Cleveland; George H. Quest, president, Blake Specialty Co., Rock Island, Ill.; T. B. Robbins, president, The Bignall Co., Medina, N. Y.; J. Walter Singmaster, president, Reading Foundry & Supply Co., Reading, Pa.; Thomas Van Helms, manager, Central Specialty Co., Detroit; F. A. Warren, president, Haley-Warren, Inc., Atlanta, and M. A. Zurn, president, J. A. Zurn Mfg. Co., Erie, Pa.

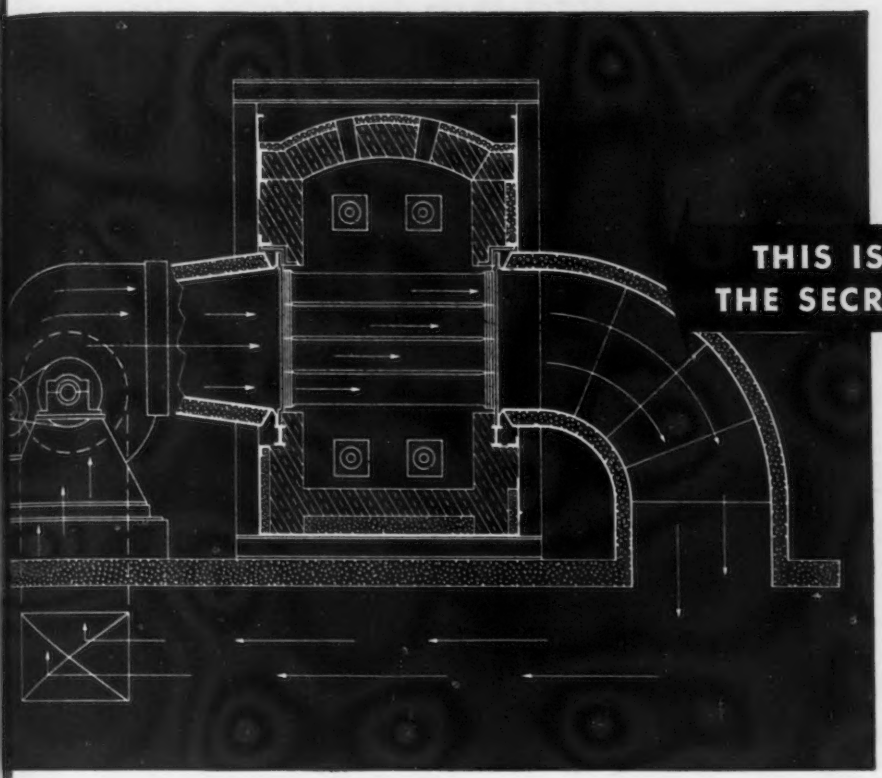
•

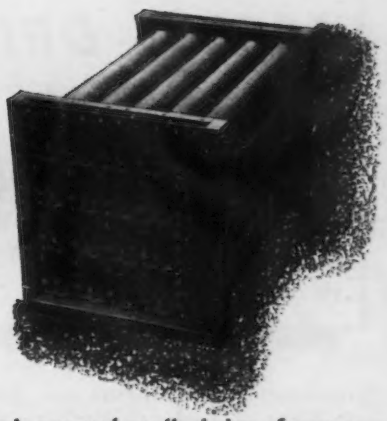
Canadians Granted More Farm Machinery

• • • **WPB has issued** an amendment to Limitation Order L-257-a increasing slightly the total permitted tonnage of farm machinery for export to Canada, during the current year. This increase will in a large measure restore the amount of the over-all cut in materials subtracted from the Canadian allocations when they were revised last August.

Impossible we were told but here it is . . . .

Salem's Recuperatube Convection Furnace





Salem's patented needle design of recuperatube makes this furnace performance possible by providing maximum transfer of heat from waste gases to air with a minimum of back pressure, and the most favorable degree of turbulence in air and waste gas streams.

High Temperature Convection Heating with Protected Atmosphere

THIS IS A REVOLUTION in convection heating because it includes all of the advantages . . . speed, uniformity, and low fuel consumption . . . yet eliminates the chief disadvantage—the products of combustion coming in contact with the material.

It represents another example of engineering ingenuity applied by Salem.

Atmosphere is heated by special Salem equipment located on top of the furnace. After circulating through the furnace, this atmosphere is returned to the heater. At no place inside the furnace can the temperature be any greater than the circulating atmosphere . . . hence, there cannot be any hot spots.

Due to the even distribution of temperature, the furnace walls and roof, as well as the materials which are being heat treated, take on such an even glow that you cannot distinguish one from the other. Since thin sections cannot become overheated, the furnace is particularly well adapted to heat treating either ferrous or non-ferrous products which have non-uniform sections.

Several of these furnaces have been installed and they are in operation. One was selected chiefly for the heating of shell cases, but it has operated so successfully that the firm is now using it for many other types of material.

This particular furnace, gas-fired, is operating up to 10,000 pounds per hour, net, at 1350°F.

Salem can build a Recuperatube Convection Furnace to your specifications, with no size or fuel limitations. Information will be furnished promptly upon request.

SALEM ENGINEERING COMPANY

SALEM ENGINEERING CO. · SALEM, OHIO

"Because

SPEEDI-DRI

has done such a splendid job, we have never used anything else,"

writes

Walter Gilby, Personnel Manager,
DRIVER-HARRIS COMPANY
Harrison, N. J.

"Since using SPEEDI-DRI our floors have been kept clean. We have also eliminated the hazards of fire and slipping. The two men who used to spend all their time cleaning our concrete floors have been given other work to do."

Few people bother to write letters of praise about a product that simply does the job it was sold to accomplish. It is only when it exceeds their expectations that they write. The hundreds of letters in our files praising SPEEDI-DRI performance are convincing testimony of the effectiveness of this product. Here are brief excerpts from other letters: "It soaks up oil and grease like a sponge." "It brightens up the whole plant." "It has reduced our cleaning costs." "It has prevented many slipping and falling accidents and enabled us to reduce accident insurance rates." "It has improved our employee morale — especially among our women workers."

SAVE VITAL MAN-POWER

A product that can do all that, and that costs as little as SPEEDI-DRI, deserves a trial in *your* plant. Write for a demonstration or a free sample. If you use water or water-soluble oils, ask for SOL-SPEEDI-DRI.

SPEEDI-DRI
OIL AND GREASE ABSORBENT

SUPPLIERS

East—REFINERS LUBRICATING CO.
New York 1, N. Y.

Midwest and South
WAVERLY PETROLEUM PRODUCTS CO.
Philadelphia 6, Pa.

West Coast
WAVERLY PETROLEUM PRODUCTS CO.
Russ Building, San Francisco 4, Calif.

Eighth List of Seized Enemy Patents Seen Useful for Post-War Industrial Planning

• • • Below is the eighth consecutive list of seized patents available to firms which obtain a license from the Alien Property Custodian. The current series began in this magazine Nov. 4, page 95, at which time complete, up-to-date information was published about the rules and procedures. Seized patent applications were listed July 8, also in the news section of this magazine.

In the items below, the sub-class number appears first, followed by the patent number, description, inventor's name and nation, and the date the patent was issued. The patent description in full may be obtained from the government as outlined in the Nov. 4 issue.

Class 78—Metal Forging and Welding

(1) 1,977,420. Hammer-tup for pneumatic and hydraulic hammers. H. Beche, Germany. 10-16-34.

(17) 1,691,075. Mandrel upsetting presses. L. Lowy, Germany. 11-13-28.

(17) 1,749,334. Forging machine and the like for effecting the movement of the gripping or clamping die or carriage on horizontal forging machines and the like in which use is made of a longitudinally movable heading die or carriage. O. Georg, Germany. 3-4-30.

(18) 1,738,593. Process of and apparatus for producing pressed railway-car axles and similar forgings. F. Lutzenkirchen, Germany. 12-10-29.

(20) 1,979,931. Swaging hammer comprising upper and lower swages mounted to move against each other in alinement with each other. H. Beche, Germany. 11-6-34.

(29) 1,957,021. Drop hammer having a friction hammer bar. A. Schneider, Germany. 5-1-34.

(25) 1,752,141. Drop hammer in which the ram is operated by a piston reciprocating within a cylinder having a supply of steam or compressed air. H. Beche, Germany. 3-25-30.

(31) 1,639,459. Spring hammer (laminated spring hammer, hammer with rubber or air buffers) in which the adjustment is rendered possible without any exertion of power. L. Knochl, Austria. 8-16-27.

(36) 2,133,984. Tongs having a bow-shaped working head wherein the tool is rectilinearly guided. M. Glas, Germany. 10-25-38.

(40) 1,841,781. Blow striking implement equipped with a reciprocating hammer head connected with a reciprocating driving member by means of two systems of springs which transmit the motion of the driving member to the hammer head. E. Bisschop, H. Ulbrich and W. Wirth, Germany. 1-19-32.

(40) 1,971,937. Power press with a crank or an eccentric for reciprocating the slide. K. Keck, Germany. 8-28-34.

(42) 1,812,797. Bundling press for bundling scrap into blocks whereby the scrap is filled into the box of the press by an auxiliary loading hopper. W. Lindemann, Germany. 6-30-31.

Copyright, 1943

(42) 1,879,356. Press used for briquetting metal turnings and borings of different description. W. Lindemann, Germany. 9-27-32.

(42) 2,167,320. Air hammer wherein the piston in the air compressing cylinder of air or pneumatic hammer is rapidly reciprocated at the end of its up stroke. S. Yabe, Japan. 7-25-39.

(46) 1,752,799. Riveting device for riveting axially extending joints of and for securing accessory parts on tubes and the like in an easier and more perfect manner. H. Junkers, Germany. 4-1-30.

(46) 2,147,763. Flush or countersunk riveting. E. Becker, Germany. 2-21-39.

(46) 2,263,283. Apparatus for heading rivets within a hollow structure formed of either magnetic or non-magnetic material, which apparatus is designed to be placed inside the hollow structure and adapted to contact the end of the rivet. E. Becker, Germany. 11-18-41.

(48) 2,215,388. Machine for riveting together sheets of metal or other material. K. Butter, Germany. 9-17-40.

(48) 2,230,518. Machine with pressure medium drive for riveting perforated workpieces. K. Weinhold, Germany. 2-4-41.

(48) 2,310,836. Machine for riveting together sheets of metal or other material. K. Butter, Germany. 2-9-43.

(49) 2,244,047. Holder-up for riveting. K. Butter, Germany. 6-3-41.

(49) 2,244,048. Rivet guiding means for riveting machines comprising a reciprocable rivet stamp. K. Butter, Germany. 6-3-41.

(51) 1,802,719. Device for riveting axially extending joints of and for securing accessory parts on tubes and the like. H. Junkers, Germany. 4-28-31.

(51) 2,147,687. Apparatus for crosswise riveting and for other striking work. E. Becker, Germany. 2-21-39.

(51) 2,218,805. Riveting apparatus suitable for the manufacture of hollow products of high quality made from comparatively thin sheet metal. E. Becker, Germany. 10-22-40.

(51) 2,221,830. Riveting device which permits of riveting hollow structures or articles the interiors of which are not readily accessible for the reception of the most riveting anvil or end stake. E. Becker, Germany. 11-19-40.

(53.50) 1,951,914. Riveting device for riveting tubes and other hollow bodies. H. Junkers, Germany. 3-20-34.

(54) 2,181,550. Rivet joint in which rivets with at least partly conical shank are employed and pressed into a correspondingly tapered rivet hole. W. Haupt, Germany. 11-28-39.

(54) 2,317,794. Rivet connection for riveting comparatively thin material such as sheets, plates and the like to relatively thick material. M. Neubert, Germany. 4-27-43.

(60) 1,761,887. Method and means for upsetting sheet metal. H. Junkers, Germany. 6-3-30.

(60) 1,761,888. Method and means for upsetting sheet metal. H. Junkers, Germany. 6-3-30.

(61) 1,809,168. Tool for upsetting or stretching sheet metal comprising two pairs of gripping jaws which are movable towards and away from each other. H. Junkers, Germany. 6-9-31.

(61) 2,010,996. Tool for producing a change of form in sheet metal. H. Junkers, Germany. 8-13-35.

(81) 1,684,950. Manufacture of skate blades with thickened edges. H. Dornseif, Germany. 9-18-28.

(81) 1,837,097. Process and apparatus for thickening tube ends. J. Barth, Germany. 12-15-31.

(92) 2,177,435. Method of making round compound metallic articles which may be tubular or solid. H. Kretz, Germany. 10-24-39.

(93) 1,898,917. Process of welding aluminum or alloys thereof to other metals. H. Wachwitz, Germany. 2-21-33.

(93) 2,138,982. Method for plating metals and alloys. U. Raydt, Germany. 12-6-38.

(96) 1,793,938. Forging apparatus wherein forgings of any desired size and cross-section may be revolved and moved to and fro without the necessity of exchanging any parts during the forging operation. H. Kuhlemeier and J. Gerhard, Germany. 2-24-31.

(101) 1,684,128. Device for bringing and holding heavy welding pieces in a suitable position during the welding process. E. Edelmann, Germany. 9-11-28.

(103) 1,819,257. Mandrel for tube rolling mills. P. Multhaupt, Germany. 8-18-31.

(103) 1,895,668. Riveting device for riveting of tubes or other hollow work pieces. H. Junkers, Germany. 1-31-33.

(8) 1,804,318. Apparatus for swaging dental plates and more particularly the kind of plates made of metal of high mechanical resistance such as rustless steel.

(13) 2,117,575. Power hammer for stamp-

H-W *improved* METALKASE

PATENTED AND PRODUCED EXCLUSIVELY BY HARBISON-WALKER

BASIC OPEN-HEARTH FURNACE LININGS

GIVE LONGER CONTINUOUS OPERATION AND GREATER TOTAL PRODUCTION

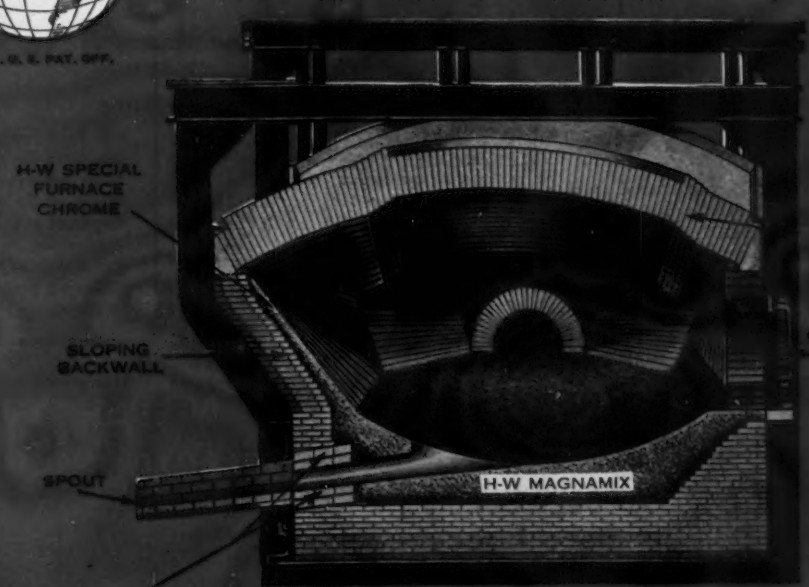
IN open-hearth front walls, H-W Improved Metalkase are giving from five to ten times the life of silica and as much as twice the life of other basic refractories.

IN open-hearth back walls, H-W Improved Metalkase are repeatedly demonstrating their superiority over other basic brick — and are giving many times the life of silica brick.

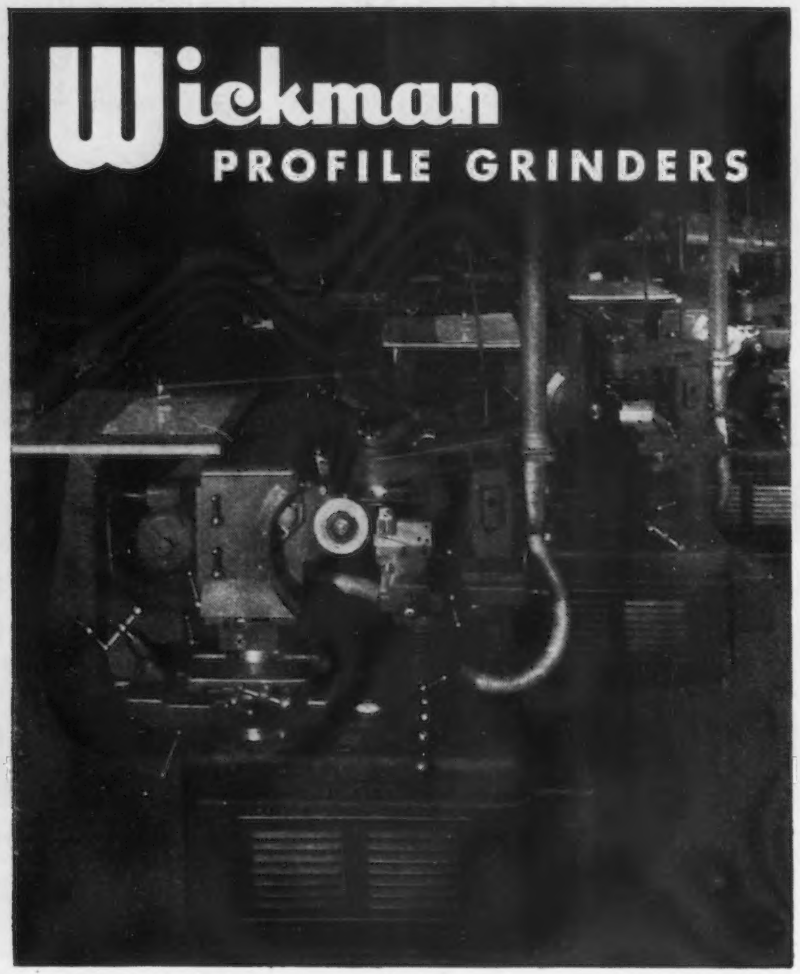
IN open-hearth end walls, H-W Improved Metalkase give two and even three complete furnace campaigns.

The use of H-W Improved Metalkase Skewbacks and of narrow shoulders of H-W Improved Metalkase at both front and back walls not only increases the life of the roofs but also results in much longer life of front and back walls.

HARBISON-WALKER REFRACTORIES COMPANY
and Subsidiaries
WORLD'S LARGEST PRODUCER OF REFRACTORIES
GENERAL OFFICES, PITTSBURGH 22, PENNA.



Wickman PROFILE GRINDERS



MAKE POSSIBLE THE GRINDING OF FORM TOOLS By Relatively *Unskilled Men*

Present users of the Wickman Profile Grinder provide the evidence to prove that the machine effects definite savings in both machining time and in skilled manpower.

A man of limited skill can produce any desired contour with this profile grinder. An accuracy to within .0005" is easily obtained and reasonable care on the part of the operator makes closer limits possible.

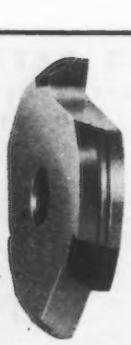
The Wickman Profile Grinder incorporates a fifty to one pantograph for controlling the formation of the profile, and a 30-power microscope for observing development of the profile and for accurate inspection of the work before it is removed from the machine. Write today for full information.

The Carboloy Company, who received the first Wickman Profile Grinder built in this country two years ago, now operate four of these machines, three of which are shown above. Here is what Carboloy says about these machines:

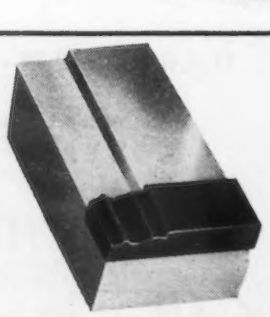
"It is difficult to quote an over-all average of time saved because the tools differ so widely but, generally speaking, the finish grinding on form tools suited to use of these machines can be done in about one-fourth the time that is required by other methods. The big advantage, in addition to the time saved, is that relatively unskilled help can do this work, and once a tool is ground to the projectograph template on this machine it is invariably correct."

TYPICAL CARBOLOY FORM TOOLS GROUND ON Wickman PROFILE GRINDERS

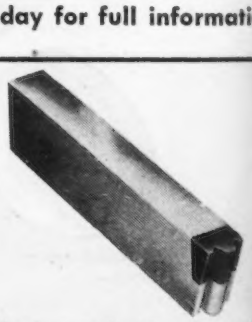
BUY MORE WAR BONDS



Circular form tool with preformed cemented carbide tips.
Stock removed ..... .015"
Grinding time including set-up .....Approx. 2 hrs.



Flat form tool with preformed cemented carbide tip.
Stock removed ..... .015"
Width of tip .....1 35/64"
Depth of cut .....¾"
Grinding time including set-up (lots of 50) .....Approx. 1¾ hrs.



Flat form tool with preformed cemented carbide tip.
Stock removed ..... .015"
Width of tip .....51/64"
Depth of cut (Carbide only) ....25/64"
Full depth of cut.....55/64"
Grinding time including set-up .....Approx. 3 hrs.

THE Wickman CORPORATION

15537 WOODROW WILSON AVE.
DETROIT, MICHIGAN

THERE are many steps between planning and completion of your ore beneficiation plant. McKee handles *all* of them under a *single contract* which places undivided responsibility in one organization.

This method, proved in 38 years of service to the Iron and Steel Industry, not only saves manifold negotiations, but eliminates overlapping responsibilities and duplication of effort.

Our ore beneficiation experience combined with thorough knowledge of Blast Furnace and Open Hearth requirements enables us to determine correct plant design and proper correlation of crushing, screening, concentrating, blending, and sintering equipment for producing beneficiated materials with physical properties best suited to your particular requirements.

Arthur G. McKee & Company

★ *Engineers and Contractors* ★

2300 CHESTER AVENUE • CLEVELAND, OHIO

KEFELLER PLAZA
W YORK, N. Y.

COMMERCE BUILDING
HOUSTON, TEXAS

ing with counter-tup. L. Saives, France. 5-17-38.

(13.1) 1,695,617. Process of and apparatus for engraving printing cylinders for producing multi-color impressions on fabrics, paper, and other material. A. Teissere and J. Teissere, France. 12-18-28.

(29) 2,196,782. Stamping machine of the plate type in which the hammer is mounted at the lower part of a vertical plate by which it is raised after making contact with the piece of work. L. Saives, France. 4-9-40.

(34) 1,645,477. Rotary impact device characterized by the feature that the weights are restrained and released by a cam device. N. Georgevitch, France. 10-11-27.

(34) 1,707,887. Rotary hammer. G. Wagner, France. 4-2-29.

(34) 1,812,692. Centrifugal hammer of the kind embodying an impact device subject to the action of centrifugal force. N. Georgevitch, France. 6-30-31.

(46) 1,895,883. Adjustable head for pin riveting. A. Hlava, Czechoslovakia. 1-31-33.

(46) 1,906,595. Adjustable head for pin riveting machines. A. Hlava, Czechoslovakia. 5-2-33.

(49) 2,244,595. Guiding means especially in machines for delivering rivets. F. Amiot, France. 6-3-41.

(49) 2,246,494. Means for assembling elements by riveting, particularly but not exclusively such means for riveting aeronautical construction elements, for example, wings or fuselage covering elements. F. Amiot, France. 6-24-41.

(92) 2,231,027. Method of producing welded joints between articles. O. Renner, Jr., Hungary. 2-11-41.

(This Feature to Be Continued in an Early Issue)

DPC Contract Awards

Washington

• • • Defense Plant Corp., RFC subsidiary, has authorized the following contracts:

Continental Aviation & Engineering Corp., Detroit, to provide additional plant facilities in Muskegon County, Mich., at a cost in excess of $40,000,000, making a total commitment of more than $55,000,000.

Cheplin Biological Laboratories, Inc., Syracuse, N. Y., to provide additional equipment at a plant in Onondaga County, N. Y., at a cost in excess of $300,000, making a total commitment of more than $1,165,000.

Weber Showcase & Fixture Co., Inc., Los Angeles, to provide equipment at a plant in Los Angeles County, Cal., at a cost in excess of $90,000.

Bower Roller Bearing Co., Detroit, to provide additional equipment at a plant in Wayne County, Mich., at a cost in excess of $150,000, making total commitment of more than $1,350,000.

Victor Adding Machine Co., Chicago, to provide additional equipment at a plant in Cook County, Ill., at a cost in excess of $35,000, making a total commitment of more than $560,000.

National Magnesium Casting Co., St. Louis, to provide plant facilities in St. Louis County, Mo., at a cost in excess of $375,000.

Split Ballbearing Corp., Lebanon, N. H., to provide equipment at a plant in Grafton, N. H., at a cost in excess of $125,000.

The Copper Alloy Foundry Co., Hillside, N. J., to provide additional facilities at a plant in Union County, N. J., at a cost in excess of $40,000, making a total commitment of more than $215,000.

The War Department has announced:

Authorization for construction of Bombardment and Replacement Training Program at Chatham Field, Savannah, Ga. The initial authorization of funds amounts to $500,000, with adjustments to be made upon receipt of field estimates. This work is to be supervised by the Savannah district office of the Corps of Engineers. The approved construction includes officers quarters, lavatories and mess; enlisted men's barracks, lavatories and mess; post exchange, chapel, theater and other miscellaneous buildings; chemical yard with concrete floor; and special bombardment training facilities.

Award of contract to Texas Bitulithic Co., Dallas, Texas, for construction at Hensley Field, Grand Prairie, Texas, estimated cost $846,972.50. This work is to be supervised by the Denison, Texas, district office of the Corps of Engineers and consists of drainage and paving for extension and reconstruction of runways.

Award of contract to the Ferro Concrete Construction Co., Cincinnati, for construction at the Dayton Signal Depot, Dayton. Estimated cost of the contract is $494,166.50. This work is to be supervised by the U. S. Engineer Office at Wright Field. Consists of construction of facility buildings, boiler plant and utilities.

New WPB Forms

WPB-1097—Customer's application for allocation of tantalum for delivery during the month.

WPB-624—Graphite: Monthly report of inventory, consumption, receipts, and sales.

WPB-165—Application for authorization to enter into toll processing agreement for aluminum or magnesium.

WPB-2923—Natural corundum primary grain: Consumer's monthly report of stocks, receipts and consumption. Monthly.

WPB-2638—Ferrocerium: Producer's quarterly report of operations.

WPB-2931—Antimony: Report of inventory, consumption and production.

WPB-2732—Idle resistance welding equipment: User's inventory report.

WPB-1801—Electric motors and generators. Monthly.

WPB-3411—Flexible metallic hose and tubing: Manufacturers' report of shipments and unfilled orders.

WPB-763—Molybdenum: Statement of stocks, consumption and request for allocation.

WPB-2912—Vanadium: Statement of stocks, consumption and request for allocation.

WPB-623—Strategic graphite: Application for authorization to accept delivery and/or put into process for making crucibles.

WPB-2922—Natural corundum superfine flour distributor's and producer's monthly report.

WPB-2020—Zinc dust: Consumer's monthly report and application for allocation.

WPB-3440—Copper wire mill equipment survey.

WPB-3161—Lubricating equipment: Manufacturers' monthly report of shipments and orders.

WPB-3174—Pig iron: Production data.

WPB-1682—Application for authorization to receive delivery of electrical indicating instruments.

WPB-2933—Alloy steel melting schedule.

WPB-3429—Manufacturer's shipping schedule for internal combustion engines.

WPB-1655—Heat treating furnaces: Manufacturer's report of furnaces ordered.

WPB-2905—Iron and steel scrap: Dealers', brokers', and automobile wreckers' report of stocks, purchases, receipts, and shipments for December, 1943.

WPB-2904—Iron and steel scrap: Consumer's report of stocks, consumption, and production for December, 1943.

WPB-2903—Iron and steel scrap: Producer's report of stocks, production, and shipment for December, 1943.

WPB-2871—Nickel: Statement of stocks, consumption and request for allocation.

WPB-2570—Application for authority to begin construction pursuant to Order L-41.

WPB-2360—Aluminum metal: Application for allotment for alloying, deoxidizing, thermit reaction, and chemical uses.

WPB-2921—Natural corundum ore and primary grain: Supplier's monthly report.

CMP-4B—Application for controlled materials and/or change in authorized production schedule.

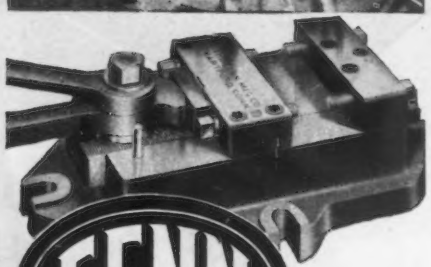
WPB-1036—Quartz crystals: Importer's and processor's monthly report of stocks, receipts, consumption, production, and shipments.

WPB-2135—Magnesite: Producer's monthly report of stocks, production, receipts, consumption, and shipments.

WPB-1081—Radium: Monthly report.

WPB-2934—Ferroalloys required for melting schedule.

WPB-2933—Alloy steel melting schedule.



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THE powerful levers instantly pull the jaws together and hold the work in a grip that is far beyond any pressure exerted by the ordinary crank operated vise.

Precision Adjustment

When the jaws of a FENN come together they take hold uniformly. This can be demonstrated by clamping two pieces of paper — .001 of an inch in thickness — one at each end of the jaws.

Proven Performance

This Quick Action Vise has been in use for 25 years. Believe it or not, in all that time we have never had a complaint as to its workmanship or performance, and we have had unstinted praise from many users.

Three sizes: 4" — 5" — 7"

Send for Bulletin No. 10

THE FENN MFG. CO.
HARTFORD, CONN.
ESTABLISHED 1900

A Specialist can do a better job for less!

Our engineers concentrate on automatic parts production methods. We apply the accumulated experience from a thousand different jobs to make new parts better and faster. We have invented special automatic equipment to machine or finish difficult parts, to eliminate hand operations, or to produce other parts as much as five times faster than is possible with standard automatic machines.

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U • S • Automatic Corporation

SCREW MACHINE PRODUCTS

AMHERST ★ OHIO

U. S. AUTOMATIC

Briefly Told—

All-Steel Wire For Power Lines Good in Certain Applications

• Step by step, all-steel transmission wire for electric power has been perfected, according to American Steel & Wire Co. The wire will span longer distances between supports and it resists the whipping action of high winds. While not designed entirely to replace copper transmission lines, the steel wire is good for such applications as use in rural and industrial areas.

•

• *All sorts of interesting sidelights are coming from the Boston area. The theft of small tools, food from lifeboats and other misdemeanors has been a source of annoyance. Alleged hoarding of labor at the Navy yard has been widely discussed. Two operators on the same machine during a single shift is a practice alleged to be not uncommon.*

•

• November employment in 100 Cleveland concerns showed a net gain, with aircraft parts plants expanding and other industries holding even or retarding slightly.

•

• General Electric Co. is now producing a small quantity of simplified electron microscopes which will soon be shipped on high priority orders to industrial laboratories and colleges to obtain experience on the use of the simplified units in various fields. This was announced by D. C. H. Bachman, in a talk in New York recently. GE says its design is unique in that it employs electrostatic lens which do not require accurate voltage regulation.

•

• John B. Fox and Jerome F. Scott, Harvard Business School, have completed a special survey of absenteeism for WPB. They concluded that industrial management to minimize absenteeism must reduce uncertainty and confusion among workers over their jobs. Proper attention must be given to the training of new employees, payment systems, shift schedules, hours of work, shop discipline and working conditions. "Our findings," they explain, "indicate that absenteeism is actually very closely tied in with overall industrial administration."

•

• The Birmingham Chamber of Commerce has announced plans to assist in obtaining jobs for returning soldiers and to aid them through the readjustment period. A service man's placement advisory board, beginning Jan. 1, will give interviews to any service man requesting aid in obtaining a job.

•

• William Chobanian, a wireman's helper in the Maintenance Department of Edgar Thomson Works, Braddock, Pa., was the 38,000th steel worker to be released by the Carnegie-Illinois Steel Corp. for service in the armed forces.

•

• A new defensive weapon known as the "smoke float" is a sturdy, portable chemical container that provides means of laying a dense blanket of smoke on a moment's notice, according to R. C. Taylor, vice-president of the American Can Co., whose engineers developed and improved the new device in collaboration with Navy Ordnance experts.

•

• Uncle Sam's new carbine made its bow in the South Pacific when the Marine Corps used it in the successful New Georgia Island Campaign which began July 5, it was revealed for the first time in a Marine Corps communication to Winchester Repeating Arms Co., New Haven, developer of the gun.

•

• A federal court has awarded Republic Steel Corp. $1,586,415 as compensation for the taking of its Monroe plant by the Defense Plant Corp., under the War Powers Act. The government assumed ownership of the plant last summer and began conversion to the manufacture of aluminum cylinder heads for aircraft.

•

• Absenteeism in the Buffalo plants of Curtiss-Wright Corp. Airplane Division has been reduced 50 per cent since the start of a drive for more production last April, according to general manager William Davey.

•

• "Safe Earthmoving," one of the first strip sound films ever dedicated to safe practices in the operation of earthmoving machinery, has been made available for free loan, both domestic and export, by R. G. LeTourneau, Inc., of Peoria, Ill. Copies of the film may be borrowed free through any LeTourneau dealer.

•

• United States war expenditures for November went to a new high of $7,794,000,000, up $689,000,000 over October. Expenditures for war from July 1, 1940, through Nov. 30 amounted to $146,000,000,000, of which $78,000,000,000 was spent in 1943.

•

• Munitions output gained in November. The index (based on November, 1941, equal to 100) stood at 665, against 647 in October. In dollar value, output was up 3 per cent over October. Aircraft gained 6 per cent; ships, 4 per cent; guns, 3 per cent; vehicles, 1 per cent. Ammunition was off 2 per cent. War construction was off 8 per cent.

•

• G. R. Armstrong, chief engineer for the Sloss-Sheffield Steel & Iron Co., Birmingham, is the new chairman for 1944 of the Southeastern section, American Institute of Mining and Metallurgical Engineers.

•

• Announcement has been made by Charles G. Young, chairman of the Industrial and Commercial Gas Section, that the 1944 American Gas Association War Conference will be held at Hotel Seneca, Rochester, N. Y., March 30 and 31.

• Resolutions urging that administration of renegotiation procedure be coordinated into a single administrative agency and that termination of contracts be subject to uniform procedure by all government agencies were passed by the Conference of American Small Business Organizations in Chicago, recently. Contractors and sub-contractors with annual sales of less than $500,000 shall be exempt, the renegotiation resolution stated.

•

• At Kearny, U. S. Steel's subsidiary, Federal Shipbuilding & Dry Dock Co., has made 145 varied craft costing half a billion dollars since Pearl Harbor, according to L. H. Korndorff, president. The total includes 47 destroyers, four troopships, two cruisers, 12 combat cargo ships, two tankers and 12 fast freighters. In addition, many smaller craft have been accounted for at Port Newark, N. J. At Kearny, a mark was set on the modern destroyer *Melvin*, built in 141 days, six times faster than normal peace-time pace.

Among the Week's Trade Notes

Detroit Tap and Tool Co., Detroit, has opened a district office at 1409 Union Central Building, Cincinnati, with E. W. Brock as district manager.

•

Interchemical Corp.'s Trade Sales Division will become the official outlet for all consumer products developed by the corporation, its divisions and subsidiaries. This change will be effective Jan. 1, 1944.

•

West Virginia Rail Co., Huntington, W. Va., has changed its corporate name to West Virginia Steel and Mfg. Co. There has been no change in organization or personnel.

•

Bristol Brass Corp., Bristol, Conn., has opened a new Pittsburgh office at 438 Oliver Building. W. E. Tootill, district manager, is in charge.

•

Michigan Tool Co., Detroit, has opened a factory service and sales district office at 1506 Toledo Trust Building, Toledo 4. M. E. Teague and W. F. Haverstock are in charge.

•

W. T. Brown, formerly manager of coal, coke and by-product research for Jones & Laughlin Steel Corp., has opened an office in the Grant Building, Pittsburgh, as consultant for coal, coke and by-products.

•

American Brake Shoe Co.'s Kellogg Division, Rochester, N. Y., has acquired the Crown Spray Gun Mfg. Co., Los Angeles.

•

E. J. Manville Machine Co., Waterbury, Conn., is liquidating a large machine shop, tentative value of equipment being $500,000.

•

Wheelco Instruments Co., Chicago, announced the following additions to its sales and service department: Cochrane Steam Specialty Co., Boston; Lang Co., Salt Lake City; western New York office at Buffalo with C. L. Clark in charge; and a Cincinnati office with C. D. Mount in charge.

•

Cannon Electric Development Co., Los Angeles, announced the following new engineering representatives: E. B. Glenn, 801 Healey Building, Atlanta, Ga.; Douglas H. Loukota, 10 Light Street, Baltimore; Ray Perron & Co., Little Building, Boston; H. M. Welch, Crosby Building, Buffalo; George Sturman, 712 Sixth Avenue S., Minneapolis; J. Tinsley Smith, 108 17th Avenue S., Nashville, Tenn.; and J. W. Beneke, 575 Arcade Building, St. Louis.

•

American Screw Co.'s offices in Detroit have been moved from the General Motors Building to Room 502 Stephenson Building.

5 YEARS EXTRA USE *for* 5¢ EXTRA COST!

Brass
Bronze
Copper
Everdur
Monel
Stainless

HARPER fastenings add years and years to the service life of products and equipment on which they are used . . . and do it at a trifling extra first cost. They insure your product against the ravages of rust and corrosion. They resist numerous acids and alkalies . . . ocean salt . . . tropic sweat. They save hours of time and labor required to replace rusted common steel bolts . . . prevent failure of vital equipment . . . keep production rolling . . . are repeatedly removable. In certain alloys they are non-magnetic and non-sparking. 4320 items in stock. Write for catalog in 4 colors.

The H. M. HARPER COMPANY
2607 Fletcher Street • Chicago 18, Illinois
BRANCH OFFICES: New York City, Philadelphia, Los Angeles, Houston, Cincinnati, Milwaukee. ***Representatives in Principal Cities***

HARPER

EVERLASTING FASTENINGS

ARMY E NAVY

PERSONALS

• **James D. Cunningham,** has been recently elected to the board of directors of Allis-Chalmers Mfg. Co., Milwaukee, succeeding **Charles W. Cox,** a director since 1913, who resigned because of ill health. Mr. Cunningham is president of the Republic Flow Meters Co. In addition, he is president of the Autogas Co., and the Smoot Engineering Co.

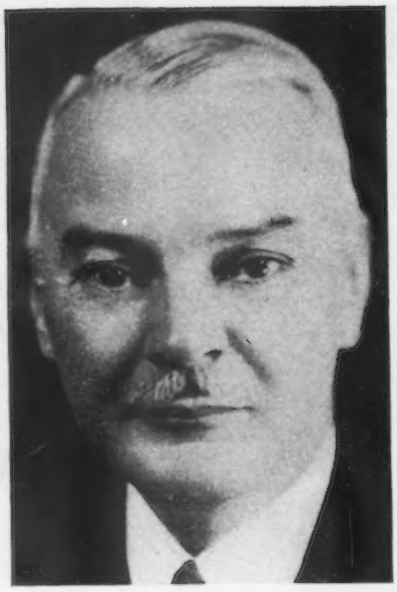
• **August H. Henrich** has joined the Auto-Diesel Piston Ring Co., Cleveland, as assistant to the vice-president and the general manager. Mr. Henrich was formerly in the experimental department Thompson Products, Inc., Cleveland. He has been associated with Cleveland Tractor Co. and Pipe Machinery Co. in experimental work and was superintendent of the Enterprise Tool Co.

• **R. D. Ulrey,** of Joshua Hendy Iron Works, Crocker-Wheeler electric division, has been made manager of their new Los Angeles office.

• **Archie Chandler,** vice-president of American Pulley Co., Philadelphia, has retired from active sales management of the company. Mr. Chandler will continue as vice-president, but will return to San Francisco, where he will direct the company's sales and service on the West Coast. **Frank E. Brown** for 15 years assistant sales manager has been named his successor.

• **O. L. Earl** has been made market development engineer in connection with postwar problems and planning of the Pressed Metal Institute. Under his direction, an engineering and market development program will be undertaken in cooperation with the government. Mr. Earl will also assist in translating wartime production experience into wider use of stampings in postwar consumer goods.

• **Donald S. Klippert** has been appointed assistant general manager of sales of the Timken steel and tube division of the Timken Roller Bearing Co., Canton, Ohio. Mr. Klippert had been Cleveland district manager of the Timken steel and tube division. **Robert P. Donnell** is to succeed him as Cleveland district manager. Mr. Donnell has been a Timken steel and tube division metallurgical engineer specializing in aircraft applications for the past six years.



JAMES D. CUNNINGHAM, member of the board of directors, Allis-Chalmers Mfg. Co., Milwaukee.

FRANK W. COPP, vice-president of Lynd-Farquhar Co., Boston.

• **R. L. Vaniman,** who resigned as director of the automotive division of the War Production Board, has been named vice-president of Fruehauf Trailer Co., Detroit, in charge of exports. Before going to Washington, Mr. Vaniman was in charge of export sales at Chrysler Corp.

• **Bruce W. Bennett** has been appointed assistant general manager of sales of American Steel & Wire Co., U. S. Steel Corp. subsidiary, and will be in charge of the New York office of the company. He succeeds **Frederick Connell** who is retiring after 45 years' association with the company. Mr. Bennett joined the company in 1909 as salesman in the electrical and wire rope department of the New York sales office. In 1929 he was appointed manager of the Wilkes-Barre office, which post he held until the present time. Mr. Connell, in 1897 became associated with the Consolidated Steel & Wire Co., a predecessor of American Steel & Wire Co., as a clerk in the Boston warehouse. He has been assistant general manager of sales with the New York office under his jurisdiction since November, 1936.

• **Frank H. Fisher** has been appointed manager of the welding and cutting division of Bastian-Blessing Co., Chicago. He will supervise promotional and sales work of the company's Rego line. He was previously associated with American Steel Foundries of Chicago and also served for a number of years with General Electric Co.'s Chicago distributer.

• **Frank W. Copp** field service engineer for Lynd-Farquhar Co., Boston, since 1930, has been elected vice-president of the company.

• **Robert T. Dunlap** has been appointed general superintendent of the Buffalo works of Wickwire Spencer Steel Co. Mr. Dunlap was recently appointed assistant to the president of Wickwire and now assumes his new duties to replace the former Buffalo General Superintendent, **William A. Steele,** who has resigned. Prior to joining Wickwire Spencer he was general works manager of the Vulcan Iron Works at Wilkes-Barre, Pa. Mr. Dunlap has also been associated with the Elliott Co. of Jeanette, Pa., as production superintendent; with Jones & Laughlin Steel Corp. of Pittsburgh as engineer, production and general superintendent and with the Pittsburgh Bridge & Iron Works as plant manager.

• **Elmer F. Richter** was made vice-president and general manager of Addressograph-Multigraph at a board of directors meeting. Two other men received promotions. They are **A. P. Tyler,** who was made secretary of the corporation and **Donald C. Adams,** who was appointed assistant secretary of the corporation.

• **Charles D. Young,** chemical engineer, has been appointed to the research staff of Battelle Memorial Institute, Columbus, Ohio, and assigned to its division of non-ferrous metallurgy.

WILLIAM E. CURRAN, vice-president in charge of manufacturing and general manager of the Eastern division of Rheem Mfg. Co.

WILLIAM A. BLUME, vice-president of American Brake Shoe Co., New York.

J. A. PROVEN, general sales manager, Sterling Tool Products Co., Chicago.

• **William E. Curran** has been appointed vice-president in charge of manufacturing of the Rheem Mfg. Co. and general manager of the Eastern division. Mr. Curran had been manager of Rheem's Richmond, Cal., plant and will make his headquarters at the company's New York office, where he will be in direct charge of the company's manufacturing operations in all of 14 plants. Prior to joining Rheem in 1942, he served 18 years as general superintendent of the Birmingham plant of the Republic Steel Co.

• **Ross Miller** has been assigned to the hoist and body sales department of Gar Wood Industries, Detroit. Mr. Miller has also become the new service manager. **W. H. Lingner** is to be his assistant, and **L. F. Avery**, whom he succeeds, is now an expediter for the company.

• **Donald J. Luty** has been raised to position of general manager of the heating division of Gar Wood Industries. Mr. Luty has been with the company for 14 years and was assistant general manager of the heating division for many years. He also held the title of chief research engineer.

• **Chris F. Tonne** has joined the All-Steel Equip. Co., Inc., of Aurora, Ill., as advertising manager. Formerly, he was advertising and sales promotion manager of Hough Shade Corp., Janesville, Wis. Mr. Tonne has had more than 17 years of experience in industrial advertising and sales promotion.

• **William A. Blume**, president since 1940 of American Brakeblok division of American Brake Shoe Co., has just been elected a Brake Shoe vice-president by the board of directors. Mr. Blume joined the Brake Shoe company as apprentice in 1915 and held various positions until 1932 when he was named vice-president of American Brakeblok and in 1940 assumed the title of president.

• **H. W. Lange** has been made sales manager of the fire division of Cardox Corp., Chicago. Prior to this Mr. Lange had for several years been chief engineer of the fire division.

• **H. E. Van Petten** has been made manager of the B. F. Goodrich advertising division in charge of tire advertising which had been under the direction of **George F. Cozzens**, who has joined the Army, as well as the advertising of the firm's industrial products and Koroseal.

• **E. O. Swearingen** of Taylor-Wharton Iron & Steel Co., High Bridge, N. J., formerly superintendent of the fettling shop, has been promoted to plant superintendent, succeeding **L. E. MacFadyen**, who became superintendent of the Easton, Pa., plant.

• **Arthur Simonson**, who has been in charge of all foundry operations for the Falk Corp., Milwaukee, since 1938, has been appointed to the newly created position of special foundry consultant.

• **E. C. Hadley**, technical division manager of the Remington Arms Co., has been made assistant to **D. F. Carpenter**, vice-president and director of manufacturing, to succeed **E. A. Doyle**, who will return to the E. I. du Pont de Nemours & Co., Inc.

• **J. A. Proven** formerly with the Victor Adding Machine Co., in various managerial positions, has joined Sterling Tool Products Co., Chicago, as general sales manager.

OBITUARY...

• **Frederick A. Ward**, who helped organize the Gear Grinding Machine Co., of which he was chief engineer up till he retired in 1937, died Dec. 7.

• **Anton A. Dreis**, secretary of the A. F. Wagner Iron Works, Milwaukee, and who had been connected with the firm for 43 years, died Dec. 2 after a short illness. He was 75 years old.

• **George E. Harris**, field representative for the Firth Sterling Steel Corp., McKeesport, Pa., died Dec. 6 in Buffalo. He was 65 years old.

• **Dr. Felix I. Tarrant**, one of the organizers of the National Cast Iron Pipe Co., Tarrant City, Ala., died Dec. 13, aged 80 years. Dr. Tarrant served as president of the company for a few years after its organization about 1912 and served as a director for many years until it became affiliated with James B. Clow & Sons in 1928.

• **Theodore E. Moser** of Moser & Cotins, Inc., died recently.

MACHINE TOOLS

. . . News and Market Activities

Veterans' Rehabilitation Seen Needed

• • • **Industry's part** in the rehabilitation of disabled veterans offers an unexcelled opportunity for enlightened management to assume one of its much talked of and little defined social responsibilities, it was pointed out by Robert M. Gaylord, president of the Ingersoll Milling Machine Co., Rockford, Ill., at a panel discussion on rehabilitation and training for postwar employment, held at the recent meeting of the National Association of Manufacturers in New York. Mr. Gaylord is the newly elected president of the association.

The job of rehabilitation is important and Mr. Gaylord urged that top management take an active part in the program in order that it does not become a matter of routine before all of its potentialities have been explored. The work of rehabilitation of disabled veterans deserves the personal attention of those men who have the responsibility of seeing that industry does its part in meeting the general problems of society, he said.

Some points stressed by Mr. Gaylord include:

(1) The handicapped veteran must not be allowed to grow to feel, because of his disability, he is an object of charity. Management knows that discontent and self-pity quickly rob producers of their efficiency.

(2) The handicapped veteran must not be allowed to feel that he has a right to a livelihood at industry's expense merely because he attends regularly his place of industrial employment. The fact that the disabled veteran has taken a course of training should not entitle him to a job at going rates of pay unless he produces effectively in competition with other men—otherwise he becomes a pensioner.

(3) While he is being encouraged and trained to become a productive and self-sustaining individual, it should be done in such a manner that his individuality develops, his earning power increases and his own dignity grows because of the work he is doing.

(4) Industry has had a great deal of experience in the past three or four years in training men and women to acquire new skills; in adapting shop work to women's skills, and in teaching employees of different races and colors to work together profitably. Rehabilitation of disabled veterans is only an enlargement of this field.

(5) Labor must cooperate with management to make it work effectively. Seniority rights, for instance, may have to give way in some instances just as accepted employment practices may have to give way in others.

(6) There will be some disabled veterans handicapped so severely they cannot find a place to work within industry. There will be some who will not want to work but prefer to remain Federal pensioners. The purchasers of manufactured goods should not bear the expense of rehabilitating them. It is an expense to be borne by all of society.

(7) Obviously, the larger units in industry must take the lead in this program since they offer a greater diversity of jobs and their personnel departments and their training programs can more easily assimilate this new phase of work.

Last and most important of all, the program must have the determined backing of top management if it is to succeed, Mr. Gaylord concluded.

•

Board of Nine Selected By Cutting Tool Association

• • • **To expedite** the formation of the new cutting tool manufacturers' association (THE IRON AGE, Dec. 16, page 78), a temporary board of nine directors has been elected with W. G. Robbins, Carboloy Co., Inc., Detroit, as chairman. Other members of the temporary board are: Oscar L. Bard, president, Michigan Tool Co., Detroit; H. R. Conner, vice-president, Detroit Broach Co., Detroit; George W. Frick, manager, Firthite Division, Firth-Sterling Steel Co., McKeesport, Pa.; E. A. Goddard, vice-president, Goddard & Goddard Co., Detroit; Norman Lawton, partner, Star Cutter Co., Detroit; R. G. Michell, president, Eclipse Counterbore Co., Detroit; R. M. Severance, president, Severance Industries, Inc., Saginaw, Mich., and R. H. Wolfe, president, Arrow Tool & Reamer Co., Detroit.

The temporary board is charged with the responsibility of developing by-laws and formulating definite plans of organization, membership qualifications, etc., of the new association.

The meeting was arranged by an organizing committee consisting of E. C. Putnam, president, Putnam Tool Co.; Mr. Robbins; Emil Gairing, president, Gairing Tool Co.; George Sheldrick, president, Midwest Tool Co.; and chairman Howard Simon of the law firm of Dahlberg and Simon.

ROBERT M. GAYLORD

• • • *As announced in this magazine last week, page 94, Mr. Gaylord is the new president of the National Association of Manufacturers. A graduate of the University of Minnesota, he joined the Ingersoll Milling Machine Co., Rockford, in 1917 as vice-president. He was elected president of the company in 1928.*

•

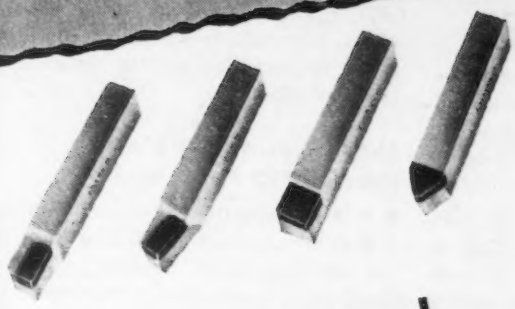
Carboloy Prices Cut On Standard Tool Line

• • • **As a result of** additional manufacturing economies in the mass production of standard single point tools, Carboloy Co., Inc., has once more reduced prices on its cemented carbide tools. With the latest reductions, prices of Carboloy cemented carbide standard cutting tools are generally comparable with those of virtually any cutting tool material, it is said. The reductions affect grades both for steel cutting and for machining nonferrous metals, cast iron and nonmetallics. The new list prices apply regardless of quantities ordered.

In the smaller sizes style T-4 and T-7 tools now range in price from 70c. (reduced 12½ per cent) for the 5/16 in. square to $2.75 (reduced 20 per cent) for the 1 in. square. Similarly style T-13 and T-14 tools now range from $1.10 (down 12 per cent) for the ½ in. square size to $2.85 (reduced 17 per cent) for the 1 in. square tools. In larger sizes the percentage of reductions is somewhat greater. Square end tools (T-1) now range in price from 70c. for the 5/16 in. square size to $4.25 (reduced 13 per cent) for the 1 by 1½ in. size.

Addition of grade 78-C to the standard tool line for sizes of ¾ in. or more is announced at the same time. This grade—designed for machining steel parts on large heavy duty machines — is exceptionally tough and shock resistant and is particularly effective for interrupted cutting of steels. Other changes include the lengthening of shanks on 14 standard tool sizes to conform with recently proposed WPB standards.

STEP UP PRODUCTION—STEP DOWN COSTS ...WITH SUPER TOOLS!



Carboloy Tipped Standard Tool Bits

For turning, boring or facing these single point tools are extremely efficient when machining all materials including hard steels. They cut fast, clean and true. The need for annealing and straightening in many cases is eliminated. Low heat absorption means less pitting when cutting soft steels. Write for descriptive literature and prices.

Carboloy Tipped Standard Milling Cutters

For faster production, greater accuracy and money-saving economy on all types of milling jobs—cast iron and non-ferrous materials as well as steel. Available in 3" to 8" diameters with 4 or 6 flutes for cast iron, brass, bronze, copper, aluminum, magnesium and plastics. For steel 6 to 16 flutes are used according to diameter. The low cost of these milling cutters permits their use on short as well as long runs. Write, wire or phone for details and prices.

Carboloy Tipped Standard Reamers

These extremely fast, true and clean cutting solid type standard reamers are available with either a straight or tapered shank. They have proved their ability to hold their size over long runs on all types of reaming jobs. Available from stock in many standard sizes and in semi-finished form for quick completion to your specifications. Details and prices on request.

Carboloy Tipped Special Tools

Super Tool Engineers, backed by years of experience and unequalled laboratory resources, stand ready to develop special Carboloy tipped tools to bring greater efficiency and economy to your specific production jobs where standard tools do not fully serve. Whatever your special job, send us your prints and specifications for recommendations and estimates.

SUPER TOOL COMPANY

21650 Hoover Road, Detroit 13, Michigan ★ 4105 San Fernando Road, Glendale 4, California

Carbide Tipped Tools

FOR TURNING • FACING • REAMING • SPOTFACING • BROACHING
FORMING • GRINDER RESTS • WEAR PARTS • BORING • MILLING • DRILLING
GROOVING • COUNTERBORING • SHAVING • CENTERS • SPECIAL PURPOSES

NON-FERROUS METALS

. . . News and Market Activities

Aluminum Research Reaches 25th Year

• • • The work of the Aluminum Research Laboratories has extended from the crude ores to the finished articles, Dr. Francis C. Frary, director of research, Aluminum Co. of America, pointed out at the 25th anniversary of the laboratories.

The cost of extracting alumina from bauxite has always been a large item in the cost of making the metal, and alternative ores and processes had been the subject of repeated investigation. A few years before the organization was established, great claims had been made abroad for the Serpek process of extracting alumina from bauxite. As has been the case with so many alumina processes, it eventually was proved that while it was technically feasible, it was economically impractical.

Acid processes were also investigated but nothing could be found to recommend them for practical use.

Other methods were studied but the obvious advantages of simplicity of process and high purity of product early led to a thorough study of the Bayer process. The stimulating competition of other alumina processes led to improvements in this one, which resulted in considerably lower production costs and a more desirable product.

The possibility of modifying the Bayer process to economically treat the large tonnages of low grade bauxite arises out of five or six years of intensive work by the East St. Louis branch on alkaline processes for extracting alumina from the red mud discarded in the Bayer process. This culminated in the Combination Process. It was carried through the pilot plant stage just in time so that it could be recommended to the government with the assurance that it would enable the recovery of most of the alumina in low grade bauxite.

Investigations of carbon electrode production and pot lining manufacture have assisted the operating department in making the advances which have characterized the past 25 years of potroom practice. At the request of the management, in 1925-26 the research laboratory cooperated with the Badin Works in the practical development of the Söderberg electrode for aluminum manufacture. The result of the joint efforts was the installation of the first commercial line of Söderberg electrode pots at Alcoa in 1927. This line is still operating successfully.

An important technical field that has required much attention is that of the testing and control of finished products. Twenty-five years of development of the methods, equipment and technique of physical testing now find the fabricating and casting plants of the company equipped with over 80 modern testing machines.

Among the researches which have aided in the sale of aluminum, Dr. Frary cited the development of the Alrok and Alumilite oxide coating processes, the Alzak process of producing reflectors, and the various brazing processes and fluxes which have facilitated the fabrication of much military material.

An interesting investigation resulted in the discovery of the alloy 27S, which was manufactured some years ago. A series of casts of alloy 25S were made and rolled in the experimental mill to supply sheet for certain investigations. As usual, each lot was tested before use, and one lot was found to have unusually high yield strength and comparatively low elongation. The reported analysis showed nothing abnormal, so another sample was analyzed with special care. Again the report showed a normal composition for this alloy. The lot was put aside for special study, and when the spectroscope subsequently arrived at the laboratory a sample was submitted for spectroscopic analysis to identify any unusual constituents which might be present. Nothing special was found except a very small amount of tin, which ordinarily is not present in aluminum of the grade used in compounding such an alloy. The amount was found to be about 0.05 per cent, and it seemed impossible that it could produce any such effect on the properties of the alloy. Nevertheless, the addition of this amount of tin to normal 25S was tried, and it was proved that the effect was actually due to it. It produced an increase of as much as 15,000 lb. per sq. in. in yield strength, together with a small increase in tensile strength and a 50 per cent reduction in elongation. Moreover, the new alloy had other advantages, particularly an improved resistance to corrosion on the artificially aged condition.

•

INCO Says Nickel Will Reach 1942 Peak Again

• • • "Production of nickel in 1943 will approximate the all-time high of the previous year, despite an acute shortage of labor and the resultant inability of the industry to use to the fullest extent its greatly expanded production facilities," Robert C. Stanley, chairman and president of the International Nickel Co. of Canada, Ltd., stated Dec. 21.

"Output of nickel in the Subdury district of Canada has in recent months dropped 10 per cent below peak production," he continued. "The decline was due to the effects of the shortage of labor as well as the consequence of having to use inexperienced workers." Other highlights of his statement include:

Demands of the war program for nickel have been met. Control of distribution by authorities in Ottawa, Washington and London mastered what appeared to be a critical situation in the supply. In the current ingot production of alloy steel within the United States, the United Kingdom and Canada about half of the required nickel is obtained from revert and purchased scrap. It is possible that in the not too distant future there will be relaxation upon nickel for civilian requirements. Consumption of nickel by the United Nations this year will be nearly double that used by those countries in the pre-war peak year. The largest consumer continues to be the United States. International Nickel's capacity has been increased by about 50,000,000 lb. of nickel per year over the 1940 output.

•

Paper Work Eased for Zinc Dust

• • • General Preference Order M-11-1, as amended, issued by WPB Dec. 13, reduces the number of applications that will be required hereafter for zinc dust by increasing the volume by about 50 per cent of the product which may be purchased without authorization.

The amendment also eliminates the requirement that consumers forward allocation certificates to the supplier for endorsement.

REFINER, SMELTER PRICES

(Cents per lb. unless otherwise noted)

Aluminum, 99+%, del'd	15.00
Aluminum, No. 12 Fdy., (No. 2)	13.50
Aluminum, deoxidizing grades	12.50 to 13.75
Antimony, Asiatic, New York	Nominal
Antimony, American, f.o.b. Laredo, Tex.	14.50
Arsenic, prime white, 99%	4.00
Brass, 85-5-5-5 ingots (No. 115)	12.25
Cadmium, del'd	90.00
Cobalt, 97-99% (dollars per lb.)	$2.11
Copper, electro, Conn. Valley	12.00
Copper, electro, New York	11.75
Copper, lake	12.00
Copper, beryllium, 3.75-4.25% Be; dollars per lb. contained Be	$15.00
Gold, U. S. Treas., dollars per oz.	$35.00
Indium, 99.5%, dollars per troy oz.	$10.00
Iridium, dollars per troy oz.	$165.00
Lead, St. Louis	6.35
Lead, New York	6.50
Magnesium, 99.9+%, carlots	21.50
Magnesium, 12-in. sticks, carlots	30.00
Mercury, dollars per 76-lb. flask, f.o.b. shipping point or port of entry	$191 to $193.00
Nickel, electro	35.00
Palladium, dollars per troy oz.	$24.00
Platinum, dollars per oz.	$35.00
Silver, open market, New York, cents per oz.	44.75
Tin, Straits, New York	52.00
Zinc, East St. Louis	8.25
Zinc, New York	8.67

Copper, Copper Base Alloys

(Mill base, cents per lb.)

	Extruded Shapes	Rods	Sheets
Copper	20.87	....	20.87
Copper, H.R.	....	17.37	....
Copper, drawn	....	18.37	....
Low brass, 80%	....	20.40	20.15
High brass	....	....	19.48
Red brass, 85%	....	20.61	20.36
Naval brass	20.37	19.12	24.50
Brass, free cut	....	15.01	....
Commercial bronze, 90%	....	21.32	21.07
Commercal bronze, 95%	....	21.53	21.28
Manganese bronze	24.00	....	28.00
Phos. bronze, A, B, 5%	....	36.50	36.25
Muntz metal	20.12	18.87	22.75
Everdur, Herculoy, Olympic or equal	....	25.50	26.00
Nickel silver, 5%	....	28.75	26.50
Architect bronze	19.12	....	.

Aluminum

(Cents per lb., subject to extras on gage, size, temper, finish, factor number, etc.)

Tubing: 2 in. O.D. x 0.065 in. wall 2S, 40c. (½H); 52S, 61c. (O); 24S, 67½c. (T).

Plate: 0.250 in. and heavier; 2S and 3S, 21.2c.; 52S, 24.2c.; 61S, 22.8c.; 24S, 24.2c.

Flat Sheet: 0.188 in. thickness; 2S and 3S, 22.7c. a lb.; 52S, 26.2c.; 61S, 24.7c.; 24S, 26.7c.

2000-lb. base for tubing; 30,000-lb. base for plate, flat stock.

Extruded Shapes: "As extruded" temper: 2000-lb. base. 2S and 3S, factor No. 1 to 4, 25.5c.; 14S, factor No. 1 to 4, 35c.; 17S, factor No. 1 to 4, 31c.; 24S, factor No. 1 to 4, 34c.; 53S, factor No. 1 to 4, 28c.; 61S, factor No. 1 to 4, 28½c.

The factor is determined by dividing perimeter of shape by weight per lineal foot.

Wire Rod and Bar: Base price; 17ST and 11ST-3, screw machine stock. Rounds: ¼ in., 28½c. per lb.; ½ in., 26c.; 1 in., 24½c.; 2 in., 23c. Hexagonals: ¼ in., 34½c. per lb.; ½ in., 28½c.; 1 in., 25½c.; 2 in., 25½c. 2S, as fabricated, random or standard lengths, ¼ in., 24c. per lb.; ½ in., 25c.; 1 in., 24c.; 2 in., 23c. 24ST, rectangles and squares, random or standard lengths. 0.093-0.187 in. thick by 1.001-2.000 in. wide, 33c. per lb.; 0.751-1.500 in. thick by 2.001-4.000 in. wide, 29c.; 1.501-2.000 in. thick by 4.001-6.000 in. wide, 27½c.

Magnesium

Sheet, rod, tubes, bars, extruded shapes subject to individual quotations. Metal turnings: 100 lb. or more, 46c. a lb.; 25 to 90 lb., 56c.; less than 25 lb., 66c.

NON-FERROUS SCRAP METAL QUOTATIONS

(OPA basic maximum prices, cents per lb., f.o.b. point of shipment, subject to quality, quantity and special preparation premiums)

Copper, Copper Base Alloys

OPA Group 1

No. 1 wire, No. 1 heavy copper	9.75
No. 1 tinned copper wire, No. 1 tinned heavy copper	9.75
No. 2 wire, mixed heavy copper	8.75
Copper tuyeres	8.75
Light copper	7.75
Copper borings	9.75
Lead covered copper wire, cable	6.00*
Lead covered telephone, power cable	6.04
Insulated copper	5.10*

OPA Group 2

Bell metal	15.50
High grade bronze gears	13.25
High grade bronze solids	11.50*
Low lead bronze borings	11.50*
Babbitt lined brass bushings	13.00
High lead bronze solids	10.00*
High lead bronze borings	10.00*
Red trolley wheels	10.75
Tinny (phosphor bronze) borings	10.50
Tinny (phosphor bronze) solids	10.50
Copper-nickel solids and borings	9.25
Bronze paper mill wire cloth	9.50
Aluminum bronze solids	9.00
Soft red brass (No. 1 composition)	9.00
Soft red brass borings (No. 1)	9.00
Gilding metal turnings	8.50
Unlined standard red car boxes	8.25
Lined standard red car boxes	7.75
Cocks and faucets	7.75
Mixed brass screens	7.75
Red brass breakage	7.50
Old nickel silver solids, borings	6.25
Copper lead solids, borings	6.25
Yellow brass castings	6.25

OPA Group 3

Yellow brass soft sheet clippings	8.625
Yellow rod brass turnings	8.375
Zincy bronze borings	8.00
Zincy bronze solids	8.00
Fired rifle shells	8.25
Brass pipe	8.00
Old rolled brass	7.75
Admiralty condenser tubes	8.00
Muntz metal condenser tubes	7.50
Plated brass sheet, pipe reflectors	7.50
Manganese bronze solids	7.25[1]
Manganese bronze solids	6.25[2]
Manganese bronze borings	6.50[1]
Manganese bronze borings	5.50[2]

OPA Group 4

Automobile radiators	7.00

OPA Group 5

Refinery brass	5.00*

*Price varies with analysis. [1] Lead content 0.00 to 0.40 per cent. [2] Lead content 0.41 to 1.00 per cent.

Aluminum

Plant scrap, segregated

2S solids	9.00
All other solids	8.50
Borings and turnings	
W'rt alloys (17S, 18S, 32S, 52S)	7.50
High grade alloys	7.00
Low grade alloys	6.50

Plant scrap, mixed

All solids	7.50
Borings and turnings	5.50

Obsolete scrap

Pure cable	9.00
Old sheet and utensils	7.50
Old castings and forgings	8.00
Pistons, free of struts	8.00
Pistons, with struts	6.00
Old alloy sheet	7.00

For old castings and forgings, pistons, sheets, add ½c. lb. for lots 1000 to 19,999 lb.; for other scrap add 1c.; for lots over 19,999 lb. add 1½c. a lb.

Magnesium

Segregated plant scrap

Pure solids and all other solids, exempt	
Borings and turnings	8.00

Mixed, contaminated plant scrap

Grade 1 solids	11.00
Grade 1 borings and turnings	7.00
Grade 2 solids	9.00
Grade 2 borings and turnings	5.00

For lots over 1499 lb. add 1c. per lb.

Zinc

New zinc clippings, trimmings	7.25
Engravers', lithographers' plates	7.25
Old zinc scrap	5.75
Unsweated zinc dross	5.80
Die cast slab	5.80
New die cast scrap	4.95
Radiator grilles, old and new	4.95
Old die cast scrap	4.50

Lead

Deduct 0.55c. a lb. from refined metal basing point prices or soft and hard lead inc. cable, for f.o.b. point of shipment price.

Nickel

Ni content 98+%, Cu under ½%, 26c. per lb.; 90 to 98% Ni, 26c. per lb. contained Ni.

ELECTROPLATING ANODES AND CHEMICALS

Anodes

(Cents per lb., f.o.b. shipping point)

Copper: Cast, elliptical, 15 in. and longer	25⅛
Electrolytic, full size	22⅞
cut to size	30⅛
Rolled, oval, straight, 15 in. and longer	23¼
Curved	24¼
Brass: Cast, 82-20, elliptical, 15 in. and longer	23⅝
Zinc: Cast, 99.99, 16 in. and over	16¼
Nickel: 99% plus, cast	47
Rolled, depolarized	48
Silver: Rolled, 999 fine per Troy (1-9) oz., per oz.	58

Chemicals

(Cents per lb., delivery from New York)

Copper cyanide, tech., 100-lb bbls. 1-5	5.65
Copper sulphate, 99.5 crystals, bbls.	13.00–13.50
Nickel salts, single, 425-lb. bbls.	34.00
Silver cyanide, 100 oz., lots	40.82–41.125
Sodium cyanide, 96% dom., 100-lb. dms.	0.15
Zinc cyanide, 100-lb. dms.	33.00
Zinc, sulphate, 89% crystals, bbls.	6.80

SCRAP

. . . News and Market Activities

Scrap Worries Dwindle Except Alloys

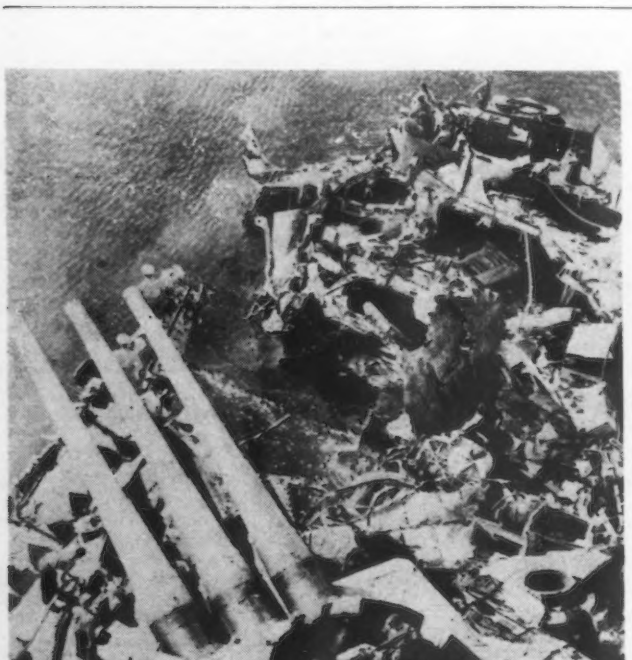
• • • **The problems** of scrap supply for the winter seem to be winning minimum recognition as year-end inventories confront consumers and contract cutbacks slice the demand for scrap. Despite this lull, the problem still appears to be very real as overall stockpiles total only about 6½ million tons and, although a number of openhearths are being reported off due to cutbacks and excesses of ingots, the ingot rate for the nation still hovers about 99. This production rate is still eating scrap at a rapid rate and the flow can be expected to dwindle perceptibly with cold weather setting in in many parts of the country.

At the moment WPB is reported most concerned about the alloy scrap situation, even though it makes up a small percentage of our total scrap supply. WPB reports an excess of alloy scrap being generated at the rate of 100,000 tons per month above consumption. The logical answer and one being urged by WPB, is to increase consumption. However, this is easier said than done.

Some interested sources have suggested that WPB relax the segregation order M-24-c so that some can move as carbon scrap. Others want the government to stockpile alloy scrap. Increased consumption is a more realistic approach in view of the fact that the WPB in October, for instance, only allocated 14,000 tons while 150,000 tons stood ready for allocation.

Greater alloy scrap consumption in the making of alloy steel is the relief sought by WPB. Average consumption now, according to WPB, in openhearths is about 41 per cent, ranging from 21 to 49 per cent; in electric furnaces consumption is 37.5 per cent ranging from 32 to 59 per cent. An increase in consumption of between 10 and 15 per cent in alloy steelmaking would solve the problem, WPB believes. Also a unification of practice between various producers, thereby eliminating the range of consumption percentages shown in the above statistics is requested.

A by-product advantage of increased consumption of alloy scrap for alloy steelmaking is that less possibility of contamination of carbon heats would result. Ways and means of increasing the use of triple-alloy steels as a method for utilizing triple-alloy scrap to a greater extent are also under consideration, it is reported.



o o o

RESURRECTED: *Her holds filled with water, her bow a mangled mass, this U. S. Navy cruiser rests on the bottom of Naples Harbor. Navy salvage workers rigged temporary patches, pumped holds dry and sailed the ship back to an American Navy Yard for repairs.*

o o o

Scrap Dealers Plan New York Convention

• • • **The board of directors** of the National Association of Waste Material Dealers, Inc., at a meeting held in New York on Dec. 7, made provision for the Association's thirty-first annual convention and war conference which is to be held at the Hotel Astor, New York on March 14 and 15, 1944.

•

Scrap Markets

BUFFALO—The situation for dealers' worsened this week, with all consumers declining to place new orders. One plant manager reported he had enough scrap to last through the winter and that he was out of the market except for "choice" items. The No. 1 consumer is making no new commitments although having a stockpile of only 35,000 tons, a month's supply. The second largest user is reported to have been notified by Washington to enter into no new scrap contracts in view of its huge reserves. The peculiar picture evoked the comment from dealers that talk of a scrap shortage was largely baloney.

•

ST. LOUIS—Steel mills in the St. Louis industrial district are said to have sufficient inventories to operate through January as cutbacks on armament jobs have caused an easing of the situation. Foundry grades are scarce.

•

PITTSBURGH—Open hearth and blast furnace grades are in good balance. Year-end inventory influences have already affected the market. Better movement is expected after the turn of the year.

•

BIRMINGHAM — No increase in the movement of material is noticeable in this area and prospects are not bright for any immediate improvement. The usual Christmas season slow-down is one of the factors keeping shipments at a low level.

•

BOSTON — Brokers report business virtually at a standstill, and activity at yards has decreased further due to absenteeism among workers and bitter cold weather. The supply of shipyard scrap has fallen off somewhat and yards in general continue to report little coming from metal working industries.

•

CINCINNATI—The withdrawal of one mill from the market during the past week has made the picture even quieter. This interest indicates that it will not produce any steel until after the first of the year, and is therefore out of the market until that time.

IRON AND STEEL (OTHER THAN RAILROAD) SCRAP

(All Prices Are Per Gross Ton)

	BASIC OPEN HEARTH GRADES		BLAST FURNACE GRADES				ELECTRIC FURNACE, ACID OPEN HEARTH AND FOUNDRY GRADES									
							Low Phos.		Heavy Structural and Plate			Foundry Steel				
	No. 1 & 2 Hvy. Melt. No. 1 Cp. Blk. Shts. No. 1 & 2 Bundles No. 1 Busheling	Unbaled* Machine Shop Turnings	Mixed Borings and Turnings	Cast Iron Borings	Shoveling Turnings	No. 2 Busheling	Billet, Bloom, Forge Crops	Bar Crops, Punchings Plate Scrap and Cast Steel	3 ft. and Under	2 ft. and Under	1 ft. and Under	2 ft. and Under	1 ft. and Under	Auto. Springs, and Crankshafts	Alloy Free Low Phos. and Sulphur Turnings	Heavy Axle and Forge Turn. First Cut	Electric Furnace Bundles
Pittsburgh, Brackenridge, Butler, Monessen, Midland, Johnstown, Sharon, Canton, Steubenville, Warren, Youngstown, Weirton	$20.00	$15.00	$15.00	$16.00	$17.00	$17.50	$25.00	$22.50	$21.50	$22.00	$22.50	$21.50	$22.00	$21.00	$18.00	$19.50	$21.00
Cleveland, Middletown, Cincinnati, Portsmouth	19.50	14.50	14.50	15.00	16.50	17.00	24.50	22.00	21.00	21.50	22.00	21.00	21.50	20.50	17.50	19.00	20.50
hicago, Claymont, Coatesville, Conshohocken, Harrisburg, Phoenixville, Sparrows Point	18.75	13.75	13.75	14.75	15.75	16.25	23.75	21.25	20.25	20.75	21.25	20.25	20.75	19.75	16.75	18.25	19.75
Ashland, Ky.	19.50	14.50	14.50	15.50	16.50	17.00	24.50	22.00	21.00	21.50	22.00	21.00	21.50	20.50	17.50	19.00	20.50
Buffalo, N. Y.	19.25	14.25	14.25	15.25	16.25	16.75	24.25	21.75	20.75	21.25	21.75	20.75	21.25	20.25	17.25	18.75	20.25
Bethlehem, Pa.; Kokomo, Ind.	18.25	13.25	13.25	14.25	15.25	15.75	23.25	20.75	19.75	20.25	20.75	19.75	20.25	19.25	16.25	17.75	19.25
Duluth, Minn.	18.00	13.00	13.00	14.00	15.00	15.50	23.00	20.50	19.50	20.00	20.50	19.50	20.00	19.00	16.00	17.50	19.00
Detroit, Mich.	17.85	12.85	12.85	13.86	14.85	15.35	22.85	20.35	19.35	19.85	20.35	19.35	19.85	18.85	15.86	17.35	18.85
Toledo, Ohio	.....	12.85	12.85	13.85	14.85	15.35	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
St. Louis, Mo.	17.50	12.50	12.50	13.50	14.50	15.00	22.50	20.00	19.00	19.50	20.00	19.00	19.50	18.50	15.50	17.00	18.50
Atlanta, Ga.; Alabama City, Ala.; Birmingham, Los Angeles; Pittsburg, Cal.; San Francisco	17.00	12.00	12.00	13.00	14.00	14.50	22.00	19.50	18.50	19.00	19.50	18.50	19.00	18.00	15.00	16.50	18.00
Minnequa, Colo.	16.50	11.50	11.50	12.50	13.50	14.00	21.50	19.00	18.00	18.50	19.00	18.00	18.50	17.50	14.50	16.00	17.50
Seattle, Wash.	14.50	9.50	9.50	10.50	11.50	12.00	19.50	17.00	16.00	16.50	17.00	16.00	16.00	15.00	12.50	14.00	15.50

* Baled turnings are $5 per gross ton higher.

BUNDLES: Tin can bundles are $4 below dealers' No. 2 bundles; No. 3 bundles are $2 less than No. 1 heavy melting.

AT NEW YORK CITY or Brooklyn, the maximum shipping point price is $15.33 for No. 1 heavy melting, f.o.b. cars, f.a.s. vessel or loaded on truck. Minimum set at $14 per gross ton at any shipping point in U. S. Other grades carry differentials similar to those in table. New Jersey prices must be computed on basis of all-rail. At Boston the maximum is $15.05 for No. 1 f.o.b. cars, f.a.s. vessel or loaded on trucks. Shipments from a New England shipping point to a consumer outside New England carry maximum transportation charge of $6.66 per ton.

SWITCHING CHARGES: Deductions for shipping points within basing points (cents per gross ton) are: Pittsburgh, Brackenridge, 55c.; Midland, Johnstown, Sharon, Youngstown, Warren, Weirton, Cleveland, Toledo, Los Angeles, San Francisco, 42c.; Butler, Monessen, Canton, Steubenville, Cincinnati*, Portsmouth, Ashland, Coatesville, Harrisburg, Phoenixville, Bethlehem, Kokomo, Duluth, St. Louis, 28c.; Buffalo, Claymont, 36c.; Conshohocken, 11c.; Atlanta, Birmingham, 32c.; Pittsburg, Cal., 42c.; Middletown, 14c.; Sparrow's Point, 11c.; Chicago, 34c.; Detroit, 53c.; Alabama City, 26c.; Minnequa, 22c.; Seattle, 38c. *At Cincinnati, for basic open hearth grades, foundry steel and auto springs and crankshafts, deduct 80c. per ton.

PITTSBURGH basing point includes switching districts of Bessemer, Homestead, Duquesne, Munhall and McKeesport. Cincinnati basing point includes Newport, Ky., switching district. St. Louis includes switching districts of Granite City, East St. Louis, Madison, Ill. San Francisco includes switching districts of S. San Francisco, Niles and Oakmont, Cal. Claymont, Del., includes the switching point of Chester, Pa. Chicago includes Gary, Ind., switching district.

MAXIMUM SHIPPING POINT PRICE—Where shipment is by rail or vessel, or by combination of rail and vessel, the scrap is at its shipping point when placed f.o.b. railroad or f.a.s. vessel. In such cases, the maximum shipping point prices shall be: (a) For shipping points located within a basing point, the price listed in the table above for the scrap at the basing point in which the shipping point is located, minus the lowest established switching charge for scrap within the basing point and (b) for shipping points located outside the basing point, the price in table above at the most favorable basing point minus the lowest transportation charge by rail or water or combination thereof. In lieu of dock charge add 75c. a ton*, but 50c. if moved by deck scow or railroad lighter. Shipping by motor vehicle: The scrap is at its shipping point when loaded. For shipping points located within basing points take price listed in table minus applicable switching charge. If located outside a basing point, the price at the most favorable basing point minus lowest established charge for transporting by common carrier. If no established transportation rate exists, the customary costs are deducted. Published dock charges prevail. If unpublished include 75c.* For exceptions see official order.

UNPREPARED SCRAP: For unprepared scrap, maximum prices shall be $3.50 (and in the case of the material from which No. 1, No. 2, and No. 3 bundles are made $4) less maximum prices for the corresponding grade or grades of prepared scrap. In no case, however, shall electric furnace and foundry grades be used as the "corresponding grade or grades of prepared scrap." Converter may charge $2.50 per ton on consumer-owned unprepared remote scrap (see order). A preparation-in-transit charge for allocated unprepared scrap is provided.

NEW LISTED GRADES: Priced in dollars per gross ton less than No. 1 heavy melting steel. Pit scrap, ladle skulls, slag reclaim, etc., of 85% or more Fe priced—$2; 75 to 85% Fe—$4; under 75% Fe—$8 per ton. Mill scale of 65% or more Fe—$8 per ton. Mill cinder and grindings, shipping point maximum price of $4 per gross ton at all U. S. shipping points.

CHEMICAL BORINGS: No. 1 (new, clean, containing not more than 1 per cent oil), $1 less than No. 1 heavy melting; No. 2 (new, clean, containing not more than 1.5 per cent oil), $2 less than No. 1 heavy melting. If loaded in box cars add 75c.

*At Memphis 50c.; Great Lakes ports $1; New England $1.25.

RAILROAD SCRAP

	No. 1 RR Heavy Melting	Scrap Rails	Rails for Rerolling	Scrap Rails 3 ft. and Under	Scrap Rails 2 ft. and Under	Scrap Rails 18 in. and Under
Cleveland, Cincinnati Ashland, Portsmouth, Middletown	$20.50	$21.50	$23.00	$23.50	$23.75	$24.00
Canton, Pittsburgh, Sharon, Steubenville, Wheeling, Youngstown	21.00	22.00	23.00	24.00	24.25	24.50
Chicago, Philadelphia Sparrows Pt., Wilmington	19.75	20.75	22.25	22.75	23.00	23.25
Birmingham, Los Angeles, San Francisco	18.00	19.00	20.50	21.00	21.25	21.50
Buffalo	20.25	21.25	22.75	23.25	23.50	23.75
Detroit	18.85	19.85	21.35	21.85	22.10	22.35
Duluth	19.00	20.00	21.50	22.00	22.25	22.50
Kansas City, Mo.	17.00	18.00	19.50	20.00	20.25	20.50
Kokomo, Ind.	19.25	20.25	21.75	22.25	22.50	22.75
Seattle	15.50	16.50	18.00	18.50	18.75	19.00
St. Louis	18.50	19.50	21 00	21.50	21.75	22.00

CAST IRON SCRAP

	Group A	Group B	Group C
No. 1 cupola cast	$18.00	$19.00	$20.00
Clean auto cast	18.00	19.00	20.00
Unstripped motor blocks	16.50	16.50	17.50
Stove Plate	17.00	18.00	19.00
Heavy Breakable Cast	16.50	16.50	17.50
Charging Box Size Cast	17.00	18.00	19.00
Misc. Malleable	20.00	21.00	22.00

Group A includes the states of Montana, Idaho, Wyoming, Nevada, Utah, Arizona and New Mexico.

Group B includes the states of North Dakota, South Dakota, Nebraska, Colorado, Kansas Oklahoma, Texas and Florida.

Group C: States not named in A and B; switching district of Kansas City, Kan., Mo.

Tool Steel Scrap Ceiling Prices Set by MPR 379, May 4, 1943

BASE PRICE SEGREGATED	Solids, Lb. Cont. W	Turnings, Lb. Cont. W
Type 1	$1.80	$1.60
Type 2	1.60	1.40
Type 3	1.25	1.25
Type 4*	0.125	0.105
Type 5*	0.135	0.115

*Per lb. of scrap material.

BASE PRICE UNSEGREGATED SOLIDS

$1.50 per lb. contained W if 5% or more.

$1.15 per lb. contained W if over 1% and less than 5%.

$0.80 per lb. contained Mo if 1½% or more.

BASE PRICE UNSEGREGATED TURNINGS

$1.30 per lb. contained W if 5% or more.

$1.00 per lb. contained W if 1% and less than 5%.

$0.70 per lb. contained Mo if 1½% or more.

Comparison of Prices . . .

Advance Over Past Week in **Heavy Type**; Declines in *Italics*. [Prices Are F.O.B. Major Basing Points]

Flat Rolled Steel: (Cents Per Lb.)	Dec. 21, 1943	Dec. 14, 1943	Nov. 23, 1943	Dec. 22, 1942
Hot rolled sheets	2.10	2.10	2.10	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.10	2.10	2.10	2.10
Plates, wrought iron	3.80	3.80	3.80	3.80
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00
Tin and Terne Plate: (Dollars Per Base Box)				
Tin plate, standard cokes	$5.00	$5.00	$5.00	$5.00
Tin plate, electrolytic	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30
Bars and Shapes: (Cents Per Lb.)				
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wrought iron bars	4.40	4.40	4.40	4.40
Wire and Wire Products: (Cents Per Lb.)				
Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.55
Rails: (Dollars Per Gross Ton)				
Heavy rails	$40.00	$40.00	$40.00	$40.00
Light rails	40.00	40.00	40.00	40.00
Semi-Finished Steel: (Dollars Per Gross Ton)				
Rerolling billets	$34.00	$34.00	$34.00	$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00
Wire Rods and Skelp: (Cents Per Lb.)				
Wire rods	2.00	2.00	2.00	2.00
Skelp (grvd)	1.90	1.90	1.90	1.90

Pig Iron: (Per Gross Ton)	Dec. 21, 1943	Dec. 14, 1943	Nov. 23, 1943	Dec. 22, 1942
No. 2 fdy., Philadelphia	$25.84	$25.84	$25.89	$25.89
No. 2, Valley furnace	24.00	24.00	24.00	24.00
No. 2, Southern Cin'ti	24.68	24.68	24.68	24.68
No. 2, Birmingham	20.38	20.38	20.38	20.38
No. 2, foundry, Chicago†	24.00	24.00	24.00	24.00
Basic, del'd eastern Pa.	25.39	25.39	25.39	25.39
Basic, Valley furnace	23.50	23.50	23.50	23.50
Malleable, Chicago†	24.00	24.00	24.00	24.00
Malleable, Valley	24.00	24.00	24.00	24.00
L. S. charcoal, Chicago	31.34	31.34	31.34	31.34
Ferromanganese‡	135.00	135.00	135.00	135.00

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton.
‡For carlots at seaboard.

Scrap: (Per Gross Ton)	Dec. 21, 1943	Dec. 14, 1943	Nov. 23, 1943	Dec. 22, 1942
Heavy melt'g steel, P'gh.	$20.00	$20.00	$20.00	$20.00
Heavy melt'g steel, Phila.	18.75	18.75	18.75	18.75
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	18.75
No. 1 hy. comp. sheet, Det.	17.85	17.85	17.85	17.85
Low phos. plate, Youngs'n	22.50	22.50	22.50	22.50
No. 1 cast, Pittsburgh	20.00	20.00	20.00	20.00
No. 1 cast, Philadelphia	20.00	20.00	20.00	20.00
No. 1 cast, Ch'go	20.00	20.00	20.00	20.00
Coke, Connellsville: (Per Net Ton at Oven)				
Furnace coke, prompt	$6.50	$6.50	$6.50	$6.00
Foundry coke, prompt	7.50	7.375	6.875	6.875
Non-Ferrous Metals: (Cents per Lb. to Large Buyers)				
Copper, electro., Conn.	12.00	12.00	12.00	12.00
Copper, Lake, New York	12.00	12.00	12.00	12.00
Tin (Straits), New York	52.00	52.00	52.00	52.00
Zinc, East St. Louis	8.25	8.25	8.25	8.25
Lead, St. Louis	6.35	6.35	6.35	6.35
Aluminum, Virgin, del'd.	15.00	15.00	15.00	15.00
Nickel, electrolytic	35.00	35.00	35.00	35.00
Magnesium, ingot	20.50	20.50	20.50	22.50
Antimony (Asiatic), N. Y.	16.50	16.50	16.50	16.50

The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 127-139.

Composite Prices . . .

Starting with the issue of April 22, 1943, the weighted finished steel price index was revised for the years 1941, 1942 and 1943. See explanation of the change on page 90 of the April 22, 1943, issue.

	FINISHED STEEL	PIG IRON	SCRAP STEEL
Dec. 21, 1943	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One week ago	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One month ago	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One year ago	2.26190c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton

	FINISHED STEEL HIGH	FINISHED STEEL LOW	PIG IRON HIGH	PIG IRON LOW	SCRAP STEEL HIGH	SCRAP STEEL LOW
1943	2.25513c.,	2.25513c.,	$23.61	$23.61	$19.17	$19.17
1942	2.26190c.,	2.26190c.,	23.61	23.61	19.17	19.17
1941	2.43078c.,	2.43078c.,	$23.61, Mar. 20	$23.45, Jan. 2	$22.00, Jan. 7	$19.17, Apr. 10
1940	2.30467c., Jan. 2	2.24107c., Apr. 16	23.45, Dec. 23	22.61, Jan. 2	21.83, Dec. 30	16.04, Apr. 9
1939	2.35367c., Jan. 3	2.26689c., May 16	22.61, Sept. 19	20.61, Sept. 12	22.50, Oct. 3	14.08, May 16
1938	2.58414c., Jan. 4	2.27207c., Oct. 18	23.25, June 21	19.61, July 6	15.00, Nov. 22	11.00, June 7
1937	2.58414c., Mar. 9	2.32263c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.67, June 8
1936	2.32263c., Dec. 28	2.05200c., Mar. 10	19.74, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.07642c., Oct. 1	2.06492c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1934	2.15367c., Apr. 24	1.95757c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.95578c., Oct. 3	1.75836c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.89196c., July 5	1.83901c., Mar. 1	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.99626c., Jan. 13	1.86586c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.25488c., Jan. 7	1.97319c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.31773c., May 28	2.26498c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3

Weighted index based on steel bars, beams, tank plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 per cent of the United States output. Index recapitulated in Aug. 28, 1941, issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

. . . Prices of Finished Iron and Steel

Steel prices shown here are f.o.b. basing points, in cents per lb., unless otherwise indicated. On some products either quantity deductions or quantity extras apply. In many cases gage, width, cutting, physical, chemical extras, etc., apply to the base price. Actual realized prices to the mill, therefore, are affected by extras, reductions, and in most cases freight absorbed to meet competition. Delivered prices do not reflect new 3 per cent tax on freight rates. GOVERNMENT CEILING—Price Schedule No. 6 issued April 16, 1941, governs steel mill prices; Price Schedule No. 49 governs warehouse prices which are on another page of this issue.

Basing Point → / Product ↓	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	Pacific Ports, Cars[10]	DELIVERED TO Detroit	New York	Philadelphia
SHEETS															
Hot rolled	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢		2.65¢	2.20¢	2.34¢	2.27¢
Cold rolled[1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.15¢	3.39¢	3.37¢
Galvanized (24 ga.)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢		4.05¢		3.74¢	3.67¢
Enameling (20 ga.)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢		4.00¢	3.45¢	3.71¢	3.67¢
Long ternes[2]	3.80¢	3.80¢	3.80¢									4.55¢		4.16¢	4.12¢
STRIP															
Hot rolled[3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.20¢	2.46¢	
Cold rolled[4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester = 3.00¢)					2.90¢	3.16¢	
Cooperage stock	2.20¢	2.20¢			2.20¢		2.20¢							2.56¢	
Commodity C-R	2.95¢	3.05¢		2.95¢			2.95¢	(Worcester = 3.35¢)					3.05¢	3.31¢	
TIN MILL PRODUCTS															
Coke tin plate, base box	$5.00	$5.00	$5.00						$5.10					5.36¢	5.32¢
.50 Electro tin plate, box	$4.50	$4.50	>4.50						$4.60						
.75 Electro tin plate, box	$4.65		>4.65						$4.75						
Black plate, 29 gage[5]	3.05¢	3.05¢	3.05¢						3.15¢			4.05¢[12]			3.37¢
Mfg. ternes, special box	$4.30	$4.30	$4.30						$4.40						
BARS															
Carbon steel	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢		(Duluth = 2.25¢)			2.50¢	2.80¢	2.25¢	2.49¢	2.47¢
Rail steel[6]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢					2.50¢	2.80¢			
Reinforcing (billet)[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢	2.55¢[13]	2.25¢	2.39¢	
Reinforcing (rail)[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.50¢	2.55¢[13]	2.25¢		2.47¢
Cold finished[8]	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢			(Detroit = 2.70¢)		(Weirton = 2.80¢)			2.99¢	2.97¢
Alloy, hot rolled	2.70¢	2.70¢				2.70¢		(Bethlehem, Massillon, Canton = 2.70¢)					2.80¢		
Alloy, cold drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢							3.45¢		
PLATES								(Coatesville and Claymont = 2.10¢)							
Carbon steel	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢	2.35¢		2.45¢	2.65¢	2.32¢	2.29¢	2.15¢
Floor plates	3.35¢	3.35¢									3.70¢	4.00¢		3.71¢	3.67¢
Alloy	3.50¢	3.50¢			(Coatesville = 3.50¢)						3.95¢	4.15¢		3.70¢	3.59¢
SHAPES															
Structural	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢		(Bethlehem = 2.10¢)			2.45¢	2.75¢		2.27¢	2.215¢
SPRING STEEL, C-R															
0.26 to 0.50 Carbon	2.80¢			2.80¢			(Worcester = 3.00¢)								
0.51 to 0.75 Carbon	4.30¢			4.30¢			(Worcester = 4.50¢)								
0.76 to 1.00 Carbon	6.15¢			6.15¢			(Worcester = 6.35¢)								
1.01 to 1.25 Carbon	8.35¢			8.35¢			(Worcester = 8.55¢)								
WIRE[9]							(Duluth = 2.65¢)								
Bright[14]	2.60¢	2.60¢		2.60¢	2.60¢		(Worcester = 2.70¢)					3.10¢			2.92¢.
Galvanized	3.40¢	3.40¢		3.40¢	3.40¢		(Duluth = 3.40¢)					3.90¢			
Spring (High Carbon)	3.20¢	3.20¢		3.20¢			(Worcester = 3.30¢)					3.70¢			3.52¢
PILING															
Steel sheet	2.40¢	2.40¢				2.40¢						2.95¢			2.72¢

[1] Mill run sheets are 10c per 100 lb. less than base; and primes only, 25c. above base. [2] Unassorted 8-lb. coating. [3] Widths up to 12 in. [4] Carbon 0.25 per cent and less. [5] Applies to certain width and length limitations. [6] For merchant trade. [7] Prices for straight length material only, from a producer to a consumer. Functional discount of 25c. per 100 lb. to fabricators. [8] Also shafting. For quantities of 20,000 to 29,999 lb. [9] Carload lot in manufacturing trade. [10] These prices do not apply if the customary means of transportation (rail and water) are not used. [12] Boxed. [13] Portland and Seattle price San Francisco price is 2.50c. [14] This bright wire base price to be used in figuring annealed and bright finish wires, commercial spring wire and galvanized wire.

EXCEPTIONS TO PRICE SCHEDULE No. 6—On hot rolled carbon bars, Phoenix Iron Co. may quote $2.40, at established basing points. Calumet Steel division of Borg Warner may quote 2.35c., Chicago on bars from its 8-in. mill; Joslyn Mfg. Co. may quote 2.35c., Chicago base. On rail steel bars Sweets Steel Co. may quote 2.35c., f.o.b. mill. On hot rolled sheets, Andrews Steel Co. may quote shipment to Detroit area on Middletown base; Parkersburg Iron & Steel may quote $2.25 per hundred f.o.b. Parkersburg, W. Va. On galvanized sheets, Andrews Steel may quote 3.75c., at established basing points; Parkersburg Iron & Steel may quote $3.85 per hundred f.o.b. Parkersburg, W. Va. Apollo Steel Co. is permitted to charge $3.75 per 100 lbs. On hot rolled strip, Joslyn Mfg. Co. may quote 2.30c., Chicago base. On plates, Granite City Steel Co. may quote 2.35c., f.o.b. mill, and Central Iron & Steel Co. may quote 2.20c., f.o.b. basing points. On shapes, Phoenix Iron Co. may quote $2.35 established basing points and 2.50c. Phoenixville for export.

On rail steel merchant bars, Eckels-Nye Corp. may charge 2.40c. On tubing, South Chester Tube Co. may price Gulf or Pacific Coast all-rail shipments and shipments west of Harrisburg on basis of f.o.b. Chester. On lend-lease sales to eastern seaboard, Sheffield Steel Co. and Colorado Fuel & Iron Corp. may sell f.o.b. mill. SEMI-FINISHED STEEL: *Billets; Rerolling*—Connors Steel Co., $50.69; Keystone Steel & Wire Co. may charge $36.40 per gross ton f.o.b. Peoria, Ill.; Phoenix Iron Co. $41.00; Continental Steel Corp. may sell Acme Steel Co. at $34.00 plus extras and freight; Ford Motor Co. $34.00 f.o.b. Dearborn, Mich.; Northwestern Steel & Wire Co. on Lend-Lease, $41.00; Wheeling Steel Co. on Lend-Lease, $36.00 for small billets f.o.b. Portsmouth, Ohio; *Billets, Forging Quality*—Follansbee Steel Corp. $49.50 f.o.b. Toronto; Andrews Steel Co. $50.00 at basing points; Pheonix Iron Co. $47.00. *Slabs*—Andrews Steel Co. $41.00; Empire Sheet & Tin Plate Corp. $41.00; Pheonix Iron Co. $41.00, rerolling grade, $47.00, forging grade. *Blooms*—Phoenix Iron Co. $41.00 rerolling grade. $47.00 forging grade. *Sheet Bar*—Empire Sheet & Tin Plate Corp. $39.00 f.o.b. mill; Wheeling Steel Corp. on Lend-Lease $37.00 f.o.b. Portsmouth, Ohio. *Other Exceptions*—Laclede Steel Co. on Lend-Lease through eastern seaboard may use Chicago basing point prices f.o.b. Alton and Madison, Ill. ALLOY STEEL BARS—Texas Steel Co. may use Chicago base f.o.b. Fort Worth.

WAREHOUSE PRICES

Delivered metropolitan areas per 100 lb. These are zoned warehouse prices in conformance with latest zoning amendments to OPA Price Schedule 49.

Cities	SHEETS			STRIP		Plates ¼ in. and heavier	Structural Shapes	BARS		ALLOY BARS			
	Hot Rolled (10 gage)	Cold Rolled	Galvanized (24 gage)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	Hot Rolled, NE 8617-20	Hot Rolled, NE 9442-45 Ann.	Cold Drawn, NE 8617-20	Cold Drawn, NE 9442-48 Ann.
Philadelphia	$3.518	$4.872[8]	$5.018a	$3.922	$4.772	$3.605	$3.666	$3.882	$4.072	....	$7.116	....	....
New York	3.590	4.613[3]	5.010	3.974[6]	4.774	3.768	3.758	3.853	4.103	$6.008	7.158	$7.303	$8.453
Boston	3.774	4.744[9]	5.224[9]	4.106	4.715	3.912	3.912	4.044	4.144	6.162	7.312	7.344	8.494
Baltimore	3.394	4.852	4.894	3.902	4.752	3.594	3.759	3.802	4.052	....	....	....	....
Norfolk	3.771	4.965	5.371	4.165	4.865	3.971	4.002	4.065	4.165	....	....	....	....
Washington	3.596	4.841	5.196[4]	4.041	4.741	3.796	3.930	3.941	4.041	....	....	....	....
Chicago	3.25	4.20	5.23	3.60	4.65[17]	3.55	3.55	3.50	3.75	5.75	6.90	8.85	8.00
Milwaukee	3.387	4.337[3]	5.272[4]	3.737	4.787[17]	3.687	3.687	3.637	3.887	5.987	7.137	7.087	8.237
Cleveland	3.35	4.40	4.877[4]	3.60	4.45	3.40	3.588	3.35	3.75	5.956	7.106	6.85	8.00
Buffalo	3.35	4.40	4.754	3.819	4.669	3.63	3.40	3.35	3.75	5.75	6.90	6.85	8.00
Detroit	3.45	4.50	5.004	3.70	5.909[17]	3.609	3.661	3.45	3.80	6.08	7.23	7.159	8.309
Cincinnati	3.425	4.475[3]	4.825[5]	3.675	4.711	3.611	3.691	3.611	4.011	....	....	....	....
St. Louis	3.397	4.247[3]	5.172[4]	3.747	4.931[17]	3.697	3.697	3.647	4.031	6.131	7.281	7.231	8.381
Pittsburgh	3.35	4.40	4.75	3.60	4.45	3.40	3.40	3.35	3.75	5.75	7.15	6.85	8.25
St. Paul	3.51	4.46	5.257[4]	3.86	4.35[17]	3.813[3]	3.813[3]	3.763[3]	4.361	6.09	7.24	7.561	8.711
Omaha	3.865	5.443	5.608[4]	4.215		4.165	4.165	4.115	4.443	....	....	....	....
Indianapolis	3.58	3.58	4.568	4.918	3.768	4.78	3.63	3.53	3.98	6.08	7.23	7.18	8.33
Birmingham	3.45	....	4.75	3.70	....	3.55	3.55	3.50	4.43	....	....	....	....
Memphis	3.85[7]	4.66	5.25	4.10	....	3.95	3.95	3.90	4.31	....	....	....	....
New Orleans	3.95	4.95	5.25	4.20	....	3.90	3.90	4.10	4.60	....	....	....	....
Houston	3.763	5.573	6.313[1]	4.313	....	4.25	4.25	3.75	6.373[3]	7.223	8.323	8.323	9.373
Los Angeles	5.00	7.203[3]	6.104	4.95	5.613[15]	4.95	4.65	4.40	5.583	8.304	9.404	9.404	10.454
San Francisco	4.55[14]	7.304	6.354	4.50[14]	7.333[17]	4.65[14]	4.35[14]	4.15[14]	5.333	8.304	9.404	9.404	10.454
Seattle	4.65[12]	7.054	5.954	4.25[12]	....	4.75[12]	4.45[12]	4.35[12]	5.783	....	9.404	....	....
Portland	4.65[11]	6.604	5.754	4.75[11]	....	4.75[11]	4.45[11]	4.45[11]	5.533	8.304	9.404	8.304	9.404
Salt Lake City	4.53[17]	....	6.171[8]	5.53[17]	....	4.98[17]	4.98[17]	4.88[17]	5.90	....	....	....	....

NATIONAL EMERGENCY (N. E.) STEELS

(Hot Rolled Mill Extras for Alloy Content)

Designation	CHEMICAL COMPOSITION LIMITS, PER CENT								Basic Open-Hearth		Electric Furnace	
	Carbon	Manganese	Phosphorus Max.	Sulphur Max.	Silicon	Chromium	Nickel	Molybdenum	Bars and Bar Strip	Billets, Blooms and Slabs	Bars and Bar Strip	Billets, Blooms and Slabs
NE 1330	.28/ .33	1.60/1.90	.040	.040	.20/ .35	.....	.....	.....	.10c	$2.00	.....	.....
NE 1335	.33/ .38	1.60/1.90	.040	.040	.20/ .35	.....	.....	.....	.10	2.00	.....	.....
NE 1340	.38/ .43	1.60/1.90	.040	.040	.20/ .35	.....	.....	.....	.10	2.00	.....	.....
NE 1345	.43/ .48	1.60/1.90	.040	.040	.20/ .35	.....	.....	.....	.10	2.00	.....	.....
NE 1350	.48/ .53	1.60/1.90	.040	.040	.20/ .35	.....	.....	.....	.10	2.00	.....	.....
NE 8613	.12/ .17	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	$25.00
NE 8615	.13/ .18	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8617	.15/ .20	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8620	.18/ .23	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8630	.28/ .33	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8635	.33/ .38	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8637	.35/ .40	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8640	.38/ .43	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8642	.40/ .45	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8645	.43/ .48	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8650	.48/ .53	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8720	.18/ .23	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40 .70	.20/ .30	.80	16.00	1.30	26.00
NE 9255	.50/ .60	.70/ .95	.040	.040	1.80/2.20	.....	.....	.....	.40	8.00	.....	.....
NE 9260	.55/ .65	.70/1.00	.040	.040	1.80/2.20	.....	.....	.....	.40	8.00	.....	.....
NE 9261	.55/ .65	.70/1.00	.040	.040	1.80/2.20	.10/ .25	.....	.....	.65	13.00	.....	.....
NE 9262	.55/ .65	.70/1.00	.040	.040	1.80/2.20	.25/ .40	.....	.....	.65	13.00	.....	.....
NE 9415	.13/ .18	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9420	.18/ .23	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9422	.20/ .25	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9425	.23/ .28	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9430	.28/ .33	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9435	.33/ .38	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9437	.35/ .40	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9440	.38/ .43	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1 25	25.00
NE 9442	.40/ .45	1.00/1.30	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9445	.43/ .48	1.00/1.30	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9450	.48/ .53	1.20/1.50	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9637*	.35/ .40	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9640*	.38/ .43	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9642*	.40/ .45	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9645*	.43/ .48	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9650*	.48/ .53	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00

***Recommended for large sections only. Note: The extras shown are in addition to a base price of 2.70c. per 100 lb., on finished products and $54 per gross ton on semi-finished steel major basing points and are in cents per 100 lb. and dollars per gross ton in semi-finished. When acid open-hearth is specified and acceptable add to basic open hearth alloy differential 0.25c. per lb. for bars and bar strip, $5.00 per gross ton for billets, blooms and slabs. The ranges shown above are restricted to sizes 100 sq. in. or less or equivalent cross sectional area 18 in. wide or under with a max. individual piece weight of 7000 lb.**

BASE QUANTITIES

Standard unless otherwise keyed on prices.

HOT ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD ROLLED: Sheets, 400 to 1999 lb.; strip, extras on all quantities; bars, 1500 to 39,999 lb.; NE alloy bars, 1000 to 39,999 lb.

EXCEPTIONS: (1) 150 to 499 lb. (2) 150 to 1499 lb. (3) 400 to 1499 lb. (4) 450 to 1499 lb. (5) 500 to 1499 lb. (6) 0 to 1999 lb. (7) 400 to 1999 lb. (8) 1000 to 1999 lb. (9) 450 to 3749 lb. (10) 400 to 3999 lb. (11) 300 to 4999 lb. (12) 300 to 10,000 lb. (13) 400 to 14,999 lb. (14) 400 to 39,999 lb. (15) 1000 to 39,999 lb. (16) 1500 to 39,999 lb. (17) 2000 to 39,999 lb. (18) 3500 to 39,999 lb.

(a) Philadelphia: Galvanized sheets, 25 or more bundles.

Extra for size, quality, etc., apply on above quotations.

CAST IRON WATER PIPE

Per Net Ton

6-in. and larger, del'd Chicago.... $54.80
6-in. and larger, del'd New York... 52.20
6-in. and larger, Birmingham 46.00
6-in. and larger f.o.b. cars, San Francisco or Los Angeles 69.40
6-in. and larger f.o.b. cars, Seattle. 71.20

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons or over, 6-in. and larger is $45 at Birmingham and $53.80 delivered Chicago, $59.40 at San Francisco and Los Angeles, and $70.20 at Seattle. Delivered prices do not reflect new 3 per cent tax on freight rates.

LAKE SUPERIOR ORES

(51.50% Fe, Natural Content, Delivered Lower Lake Ports)*

Per Gross Ton

Old range, bessemer, 51.50 .....$4.75
Old range, non-bessemer, 51.50..... 4.60
Mesaba, bessemer, 51.50 ..... 4.60
Mesaba, non-bessemer, 51.50 ..... 4.45
High phosphorus, 51.50 ..... 4.35

*Adjustments are made to indicate prices based on variance of Fe content of ores as analyzed on a dry basis by independent laboratories.

PRICES

COKE

Furnace

	Per Net Ton
†Connellsville, prompt	$6.50*

Foundry

†Connellsville, prompt	7.50
Fayette County, W. Va. (Beehive)	8.10
By-product, Chicago	12.30
By-product, New England	13.75
By-product, Newark	13.40 to 12.95
By-product, Philadelphia	12.38
By-product, Cleveland	12.30
By-product, Cincinnati	11.75
By-product, Birmingham	9.30†
By-product, St. Louis	12.02
By-product, Buffalo	12.50

*Hand-drawn ovens using trucked coal are permitted to charge $7.00 per net ton, plus usual transportation. Maximum beehive furnace coke prices established by OPA, Feb. 8, 1942. †F.o.b. oven.

FLUORSPAR

Maximum price f.o.b. consumer's plant, $30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is lower.

Exception

When the WPB Steel Division certifies in writing the consumer's need for one of the higher grades of metallurgical fluorspar specified in the table below the price shall be taken from the table plus items (1 and 2) from paragraph above.

Effective CaF_2 Content:	*Base price per short ton*
70% or more	$33.00
65% but less than 70%	32.00
60% but less than 65%	31.00
Less than 60%	30.00

REFRACTORIES

(*F.o.b. Works*)

Fire Clay Brick	*Per 1000*
Super-duty brick, St. Louis	$64.60
First quality, Pa., Md., Ky., Mo., Ill.	51.30
First quality, New Jersey	56.00
Sec. quality, Pa., Md., Ky., Mo., Ill.	46.55
Second quality, New Jersey	51.00
No. 1, Ohio	43.00
Ground fire clay, net ton	7.60
Silica Brick	
Pennsylvania and Birmingham	$51.30
Chicago District	58.90
Silica cement, net ton (Eastern)	9.00
Chrome Brick	*Per Net Ton*
Standard, chemically bonded, Balt., Plymouth Meeting, Chester	$54.00
Magnesite Brick	
Standard, Balt. and Chester	$76.00
Chemically bonded, Baltimore	65.00
Grain Magnesite	
Domestic, f.o.b. Balt. and Chester in sacks (carloads)	$44.00
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

INGOTS

Carbon, Rerolling grade

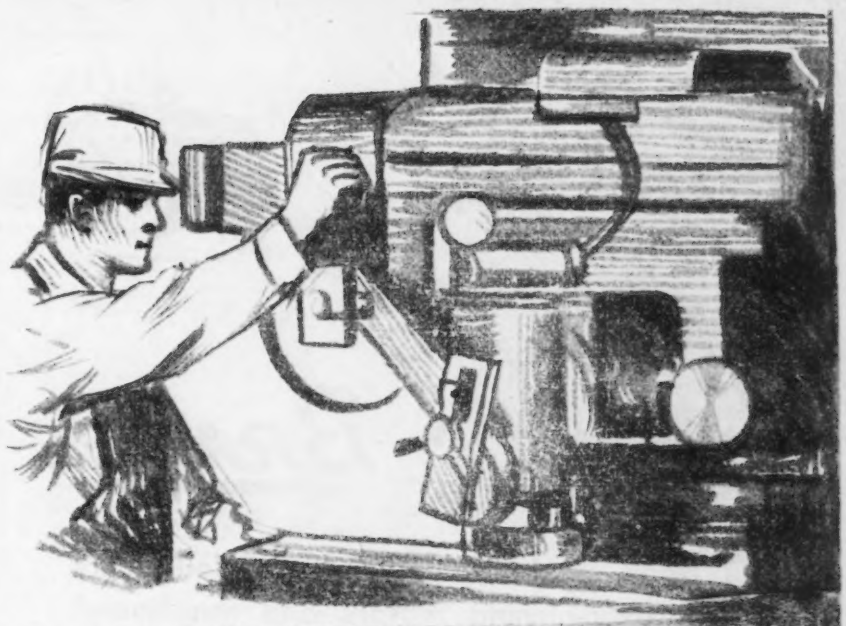
Base per gross ton, f.o.b. mill.... $31.00
Exceptions: Phoenix Iron Co. may charge $38.75; Kaiser Co., $43.00 f.o.b. Pacific Coast Ports; Empire Sheet & Tinplate Co., $34.25; Carnegie-Illinois Steel Corp. (Pencoyd Plant), $38.25.

Carbon, Forging Quality

Base per gross ton, f.o.b. Birmingham, Buffalo, Chicago, Cleveland, Gary, Pittsburgh, Youngstown $36.00
Exceptions: Phoenix Iron Co. may charge $43.00; Empire Sheet & Tinplate Co., $39.25, f.o.b. Mansfield, Ohio; West Coast producers, $48.00, f.o.b. Pacific Coast Ports.

Alloy

Base per gross ton, f.o.b. Bethlehem, Buffalo, Canton, Massillon, Pittsburgh $45.00
Exceptions: C/L delivered Detroit add $2.00; delivered East Michigan add $3.00. Connors Steel Co. may charge $45.00 f.o.b. Birmingham.



MANY A SURFACING PROBLEM PROMPTLY SOLVED

Dayton 846-K-1 wheels are particularly effective on unusual or difficult surface grinding operations, and hundreds of plants use them.

They produce an excellent finish. They remove stock rapidly and are truly a "production" wheel. They wear down slowly and are, therefore, economical.

Definitely recommended for precision grinding of hardened steel parts and for mild steel surfacing. Effective on a wide variety of materials. Complete range of sizes.

What is YOUR surfacing problem? We may be able to ship from stock and help you solve that problem.

SIMONDS WORDEN WHITE COMPANY
711 NEGLEY PLACE, DAYTON, OHIO

The Dayton line is a complete line and stocks are carried for emergency calls. Dayton engineering service on grinding problems. Wire, write or phone.

DAYTON GRINDING WHEELS

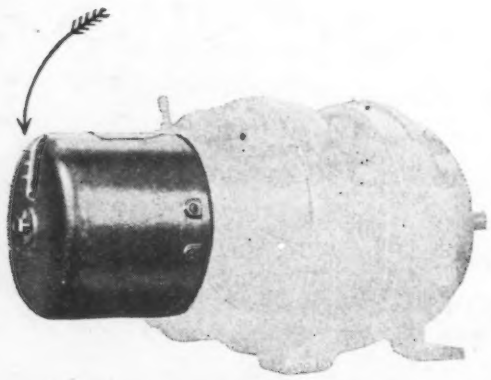
STOP THAT MOTOR! WITH Stearns MAGNETIC BRAKES

Don't waste valuable production hours with over-running motors and machinery! Put Stearns Magnetic Brakes on the job.

If you have a stopping problem on rotating machinery, investigate the smooth, fast braking offered by Stearns Magnetic Milwaukee.

We'd like to tell you about some of the many successful motor and machinery manufacturers who have for years been specifying Stearns brakes, proof of their dependability, right design and construction.

Ask for our Brake Bulletin 604.



The magnetic brake with the lining wear indicator and manual release—distinctive, original

SEPARATORS DRUMS ROLLS

CLUTCHES PULLEYS

SPECIAL MAGNETS

Stearns MAGNETIC MFG. CO.

635 S. 28th St. Milwaukee, Wis.

PRICES

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts
(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts:

	Per Cent Off List
½ in. & smaller x 6 in. & shorter	65½
9/16 & ⅝ in. x 6 in. & shorter	63½
¾ to 1 in. x 6 in. & shorter	61
1⅛ in. and larger, all length	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed:
(Hexagon or Square)

½ in. and smaller	62
9/16 to 1 in. inclusive	59
1⅛ to 1½ in. inclusive	57
1⅝ in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.

Semi-Fin. Hexagon Nuts	U.S.S.	S.A.E.
7/16 in. and smaller	..	64
½ in. and smaller	62	..
½ in. through 1 in.	..	60
9/16 to 1 in.	59	..
1⅛ in. through 1½ in.	57	58
1⅝ in. and larger	56	..

In full container lots, 10 per cent additional discount.

Stove Bolts

Packages, nuts loose	71 and 10
In packages, with nuts attached	71
In bulk	80

On stove bolts freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago, New York on lots of 200 lb. or over.

Large Rivets *(½ in. and larger)*

	Base per 100 lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.75

Small Rivets *(7/16 in. and smaller)*

	Per Cent Off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	65 and 5

Cap and Set Screws

	Per Cent Off List
Upset full fin. hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Fillister head cap, listed sizes	51

Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

RAILS, TRACK SUPPLIES

(F.o.b. Mill)

Standard rails, heavier than 60 lb., No. 1 O.H., gross ton	$40.00
Angles bars, 100 lb.	2.70
(F.o.b. Basing Points)	*Per Gross Ton*
Light rails (from billets)	$40.00
Light rails (from rail steel)	39.00
	Base per Lb.
Cut spikes	3.00c.
Screw spikes	5.15c.
Tie plates, steel	2.15c.
Tie plates, Pacific Coast	2.30c.
Track bolts	4.75c.
Track bolts, heat treated, to railroads	5.00c.
Track bolts, jobbers discount	63-5

Basing points, light rails, Pittsburgh, Chicago, Birmingham; spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo; spikes alone—Youngstown, Lebanon, Pa., Richmond.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00

PRICES

ELECTRICAL SHEETS

(Base, f.o.b. Pittsburgh)

	Per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

F.o.b. Granite City, add 10c. per 100 lb. on field grade to and including dynamo. Pacific ports add 75c. per 100 lb. on all grades.

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham

	Base per Keg
Standard wire nails	$2.55
Coated nails	2.55
Cutnails, carloads	3.85
	Base per 100 Lb.
Annealed fence wire	$3.05
Annealed galvanized fence wire	3.40
	Base Column
Woven wire fence*	67
Fence posts (carloads)	69
Single loop bale ties	59
Galvanized barbed wire†	70
Twisted barbless wire	70

*15½ gage and heavier. †On 80-rod spools in carload quantities.

WELDED PIPE AND TUBING

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

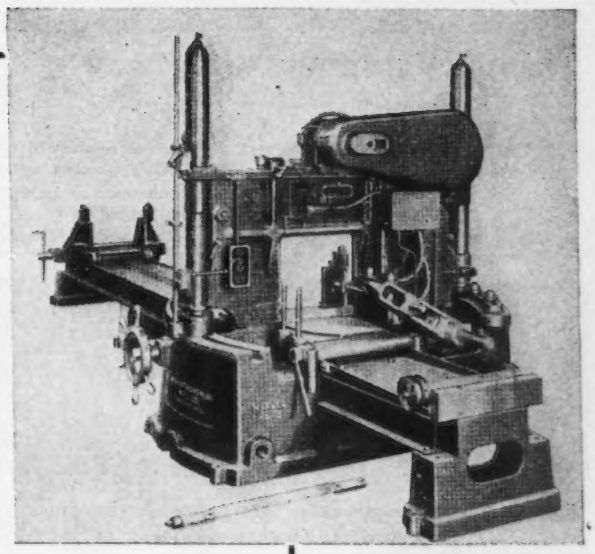
(F.o.b. Pittsburgh only on wrought pipe)
Base Price—$200 per Net Ton

	Black	Galv.
Steel (Butt Weld)		
½ in.	63½	51
¾ in.	66½	55
1 to 3 in.	68½	57½
Wrought Iron (Butt Weld)		
½ in.	25	3½
¾ in.	30	10
1 and 1¼ in.	34	16
1½ in.	38	18½
2 in.	37½	18
Steel (Lap Weld)		
2 in.	61	49½
2½ and 3 in.	64	52½
3½ to 6 in.	66	54½
Wrought Iron (Lap Weld)		
2 in.	30½	12
2½ to 3½ in.	31½	14½
4 in.	33½	18
4½ to 8 in.	32½	17
Steel (Butt, extra strong, plain ends)		
½ in.	61½	50½
¾ in.	65½	54½
1 to 3 in.	67	57
Wrought Iron (Same as Above)		
½ in.	25	6
¾ in.	31	12
1 to 2 in.	38	19½
Steel (Lap, extra strong, plain ends)		
2 in.	59	48½
2½ and 3 in.	63	52½
3½ to 6 in.	66½	56
Wrought Iron (Same as Above)		
2 in.	33½	15½
2½ to 4 in.	39	22½
4½ to 6 in.	37½	21

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher on all butt weld.

CUTS the Toughest Steels and Largest Sizes *easily.*



This giant hydraulic metal-cutting saw is more than just a larger hack saw. It is a new development in metal-cutting methods that introduces a new principle of metal sawing — the Roll-stroke blade action makes it possible to cut the toughest steels in the largest sizes easily and rapidly. It also permits a simple and efficient, very low pressure Hydraulic Feed System.

Built for heavy work, completely enclosed in heavy housing, this machine will stand up under the rough usage of the average steel mill warehouse and forge shop, where it will speed cutting-off, and reduce material loss.

MARVEL No. 18
Giant Hydraulic Hack Saw
Capacity 18"x18"

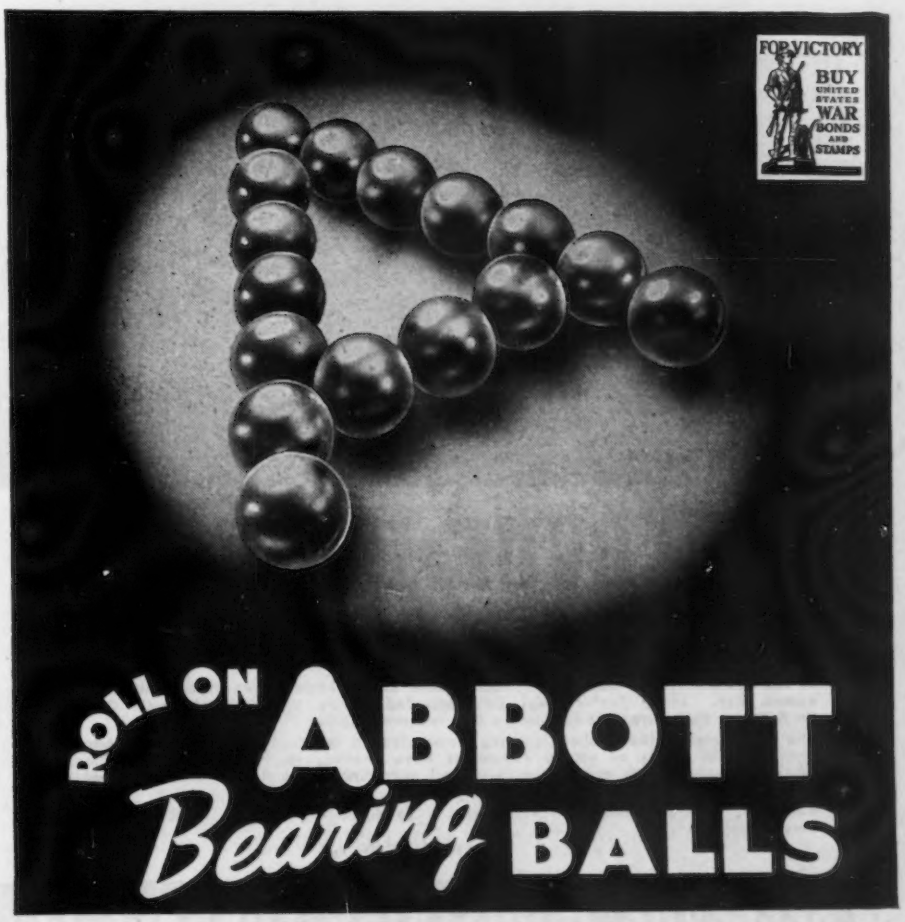
Cuts angles up to 45° by simply swiveling upper machine housing.

Write for Catalog

MARVEL SAWS

ARMSTRONG-BLUM MFG. CO.
"The Hack Saw People"
5700 Bloomingdale Ave., Chicago, U. S. A.

Eastern Sales Office
225 Lafayette St., New York



• THE ABBOTT BALL COMPANY • HARTFORD, CONN., U.S.A. •

PIG IRON

All prices set in bold face type are maxima established by OPA on June 24, 1941. Other domestic prices (in italics) are delivered quotations per gross ton computed on the basis of the official maxima. Delivered prices do not reflect 3 per cent tax on freight rates.

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phosphorus	Charcoal
Boston (3)	*$25.50*	*$25.00*	*$26.50*	*$25.50*	.....	.....
Brooklyn	*27.50*	.....	.....	*28.00*	.....	.....
Jersey City	*26.53*	*26.03*	*27.53*	*27.03*	.....	.....
Philadelphia (5)	*25.84*	*25.34*	*26.84*	*26.34*	*$30.74*	.....
Bethlehem, Pa.	25.00	24.50	26.00	25.50	.....	.....
Everett, Mass (3)	25.00	24.50	26.00	25.50	.....	.....
Swedeland, Pa.	25.00	24.50	26.00	25.50	.....	.....
Steelton, Pa.	.....	24.50	.....	.....	29.50	.....
Birdsboro, Pa. (4)	25.00	24.50	26.00	25.50	29.50	.....
Sparrows Point, Md.	25.00	24.50	.....	.....	.....	.....
Erie, Pa.	24.00	23.50	25.00	24.50	.....	.....
Neville Island, Pa.	24.00	23.50	24.50	24.00	.....	.....
Sharpsville, Pa. (1)	24.00	23.50	24.50	24.00	.....	.....
Buffalo	24.00	23.00	25.00	24.50	29.50	.....
Cincinnati, Ohio	*23.94*	*23.94*	.....	*25.11*	.....	.....
Canton, Ohio	*25.39*	*24.89*	*25.89*	*25.39*	*32.69*	.....
Mansfield, Ohio	*25.94*	*25.44*	*26.44*	*25.94*	*32.86*	.....
St. Louis	*24.50*	*24.50*	.....	.....	.....	.....
Chicago	24.00	23.50	24.50	24.00	*35.46*	.....
Granite City, Ill.	24.00	23.50	24.50	24.00	.....	.....
Cleveland	24.00	23.50	24.50	24.00	*32.42*	.....
Hamilton, Ohio	24.00	23.50	.....	24.00	.....	.....
Toledo	24.00	23.50	24.50	24.00	.....	.....
Youngstown	24.00	23.50	24.50	24.00	*32.42*	.....
Detroit	24.00	23.50	24.50	24.00	.....	.....
Lake Superior fc.	.....	.....	.....	.....	.....	34.00
Lyles, Tenn. fc. (2)	.....	.....	.....	.....	.....	33.00
St. Paul	*26.76*	.....	*27.26*	*26.76*	*39.80*	.....
Duluth	24.50	24.00	25.00	24.50	.....	.....
Birmingham	20.38	19.00	25.00	.....	.....	.....
Los Angeles	*26.95*	.....	.....	.....	.....	.....
San Francisco	*26.95*	.....	.....	.....	.....	.....
Seattle	*26.95*	.....	.....	.....	.....	.....
Provo, Utah	22.00	21.50	.....	.....	.....	.....
Montreal	*27.50*	*27.50*	.....	*28.00*	.....	.....
Toronto	*25.50*	*25.50*	.....	*26.00*	.....	.....

GRAY FORGE IRON: Valley or Pittsburgh furnace $23.50

(1) Pittsburgh Coke & Iron Co. (Sharpsville, Pa., furnace only) and the Struthers Iron and Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable.

(2) Price shown is for low-phosphorous iron; high-phosphorous sells for $28.50 at the furnace.

(3) Eastern Gas & Fuel Associates, Boston, is permitted to sell pig iron produced by its selling company, Mystic Iron Works, Everett, Mass., at $2 per gross ton above maximum prices.

(4) E. & G. Brooke Co. permitted to charge $1.00 per ton extra.

(5) Pittsburgh Ferromanganese Co. (Chester furnace only) may charge $2.25 a ton over maximum basing point prices.

Basing point prices are subject to switching charges; silicon differentials (not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of base grade which is 1.75 per cent to 2.25 per cent); phosphorous differentials, a reduction of 38c. per ton for phosphorous content of 0.70 per cent and over; manganese differentials, a charge not to exceed 50c. per ton for each 0.50 per cent manganese content in excess of 1.00 per cent. Effective March 3, 1943, $3 per ton extra may be charged for 0.5 to 0.75 per cent nickel content and $1 per ton extra for each additional 0.25 per cent nickel.

METAL POWDERS

Prices are based on current market prices of ingots plus a fixed figure. For ton lots f.o.b. shipping point, in cents per lb.

Copper, electrolytic, 150 and 200 mesh	21⅛ to 23¼c.
Copper, reduced, 150 and 200 mesh	20⅛ to 25¼c.
Iron, commercial, 100 and 200 mesh	13½ to 15c.
Iron, crushed, 200 mesh and finer	40c.
Iron, hydrogen reduced, 300 mesh and finer	63c.
Iron, electrolytic, unannealed, coarser than 300 mesh	30 to 33c.
Iron, electrolytic, annealed minus 100 mesh	42c.
Iron, carbonyl, 300 mesh and finer	90c.
Aluminum, 100 and 200 mesh	*23 to 27c.
Antimony, 100 mesh	20.6c.
Cadmium, 100 mesh	$1
Chromium, 150 mesh	$1.00
Lead, 100, 200 & 300 mesh, 11½ to 12½c.	
Manganese, 150 mesh	51c.
Nickel, 150 mesh	51½c.
Solder powder, 100 mesh, 8½c. plus metal	
Tin, 100 mesh	58¾c.
Tungsten metal powder, 98%-99%, any quantity, per lb.	$2.00
Molybdenum powder, 99%, in 200-lb. kegs, f.o.b. York, Pa., per lb.	$2.00
Under 100 lb.	$2.00

*Freight allowed east of Mississippi.

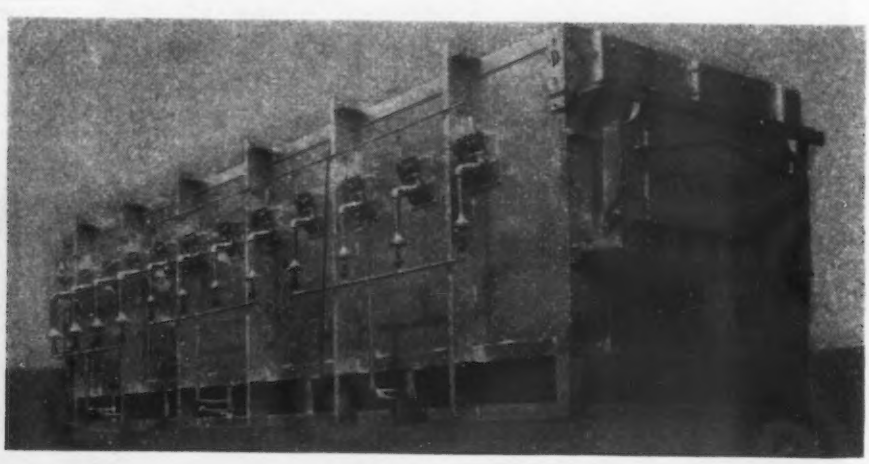
BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes. Minimum Wall. Net base prices per 100 ft. f.o.b. Pittsburgh, in carload lots.

	Seamless Cold Drawn	Seamless Hot Rolled	Lap Weld Hot Rolled
2 in. o.d. 13 B.W.G.	15.03	13.04	12.33
2½ in. o.d. 12 B.W.G.	20.21	17.54	16.58
3 in. o.d. 12 B.W.G.	22.48	19.50	18.35
3½ in. o.d. 11 B.W.G.	28.37	24.62	23.16
4 in. o.d. 10 B.W.G.	35.20	30.54	28.86

(Extras for less carload quantities)

40,000 lb. or ft., and over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	20%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%



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The soundness of that policy is being demonstrated in plant after plant. Hundreds of executives in scores of varied companies have proved, to their own satisfaction, the efficiency, speed, high production level and operating economies of Bellevues that were "designed" for the job.

You, too, will find Bellevue experience and facilities a profitable investment for your own furnace needs.

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BELLEVUE INDUSTRIAL FURNACE CO.
2974 BELLEVUE AVENUE DETROIT, MICH.

PRICES

SEMI-FINISHED STEEL

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are $2.00 higher; f.o.b. Duluth, billets only, $2.00 higher; billets f.o.b. Pacific ports are $12 higher. Delivered prices do not reflect new three per cent tax on freight rates.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

For exceptions on semi-finished steel see the footnote on the page of finished steel prices.

Alloy Steel

Pittsburgh, Chicago, Canton, Massillon, Buffalo, or Bethlehem, per gross ton 54.00

Shell Steel

	Per Gross Ton
3 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Basic open hearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.

Prices delivered Detroit are $2.00 higher.

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(*No. 5 to 9/32 in.*)

	Per Lb.
Pittsburgh, Chicago, Cleveland	2.00c.
Worcester, Mass.	2.10c.
Birmingham	2.00c.
San Francisco	2.50c.
Galveston	2.25c.

9/32 in. to 47/64 in., 0.15c. a lb. higher. Quantity extras apply.

TOOL STEEL

(*F.o.b. Pittsburgh, Bethlehem, Syracuse*)

	Base per lb.
High speed	67c.
Straight molybdenum	54c.
Tungsten-molybdenum	57½c.
High-carbon-chromium	43c.
Oil hardening	24c.
Special carbon	22c.
Extra carbon	18c.
Regular carbon	14c.

Warehouse prices east of Mississippi are 2c. a lb. higher; west of Mississippi 3c. higher.

CORROSION AND HEAT-RESISTING STEEL

(*Per lb. base price, f.o.b. Pittsburgh*)

Chromium-Nickel Alloys

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium Alloys

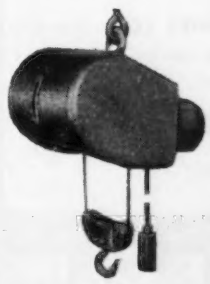
	No. 410	No. 430	No. 442	No. 446
F.Billets	15.725c.	16.15c.	19.125c.	23.375c.
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
Hot strip	17.00c.	17.50c.	24.00c.	35.00c.
Cold strip	22.00c.	22.50c.	32.00c.	52.00c.

Chromium-Nickel Clad Steel (20%)

	No. 304
Plates	18.00c.*
Sheets	19.00c.

*Includes annealing and pickling.

CONCO 3-Motor Single Girder CAB OR FLOOR OPERATED ELECTRIC CRANE . . .



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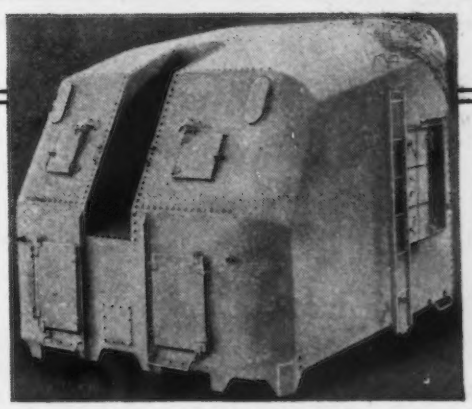
Write for Bulletin 26000 describing the Torpedo Hoist shown. Three capacities 250 lb.—$139.50, 500 lb.—$149.50, 1000 lb.—$159.50. Heavily, simply built, with Push Button Control. Outstanding in CONCO'S complete line of hand-powered and electric Cranes, Hoists, Trolleys.

CONCO ENGINEERING WORKS

Div. of H. D. Conkey & Co. — 15 Grove St. — Meadota, Ill.

Builders Of Conco Torpedo Electric Hoist



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High Carbon-Low Carbon

Round — Half Round — Oval — Square — Flat—Triangular and Special Shapes.

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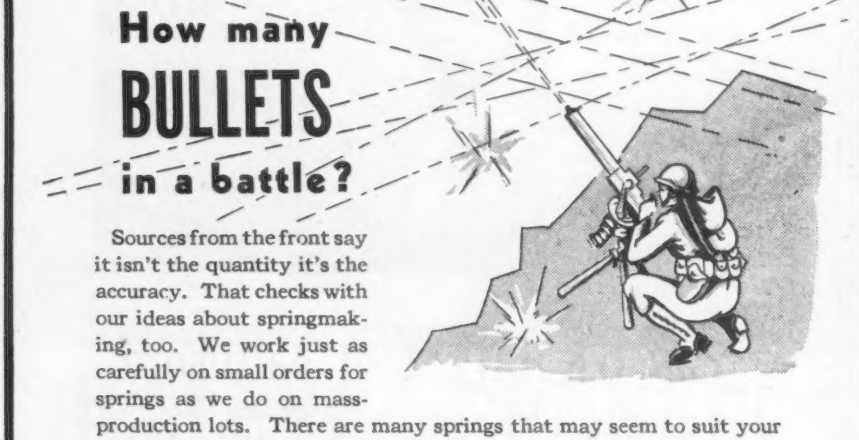
AIRCRAFT CABLE WIRE (XLO Brand) extra high fatigue wire drawn under constant laboratory control.

MUSIC WIRE (XLO Brand) wire of a thousand uses. (WD-1085 — WD-1095). Wire sizes .005" to .200" dia.

JOHNSON STEEL & WIRE CO., INC.

WORCESTER 1, MASSACHUSETTS.

NEW YORK ATLANTA AKRON CHICAGO LOS ANGELES



How many BULLETS in a battle?

Sources from the front say it isn't the quantity it's the accuracy. That checks with our ideas about springmaking, too. We work just as carefully on small orders for springs as we do on mass-production lots. There are many springs that may seem to suit your requirement — there's only **one** that meets all conditions of efficient manufacture and performance. Dunbar experience helps to select that spring — and to produce it efficiently and economically.

There's plenty of fight in springs made by

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Division of Associated Spring Corporation

PRICES

Ferromanganese

78-82% manganese, maximum contract base price per gross ton, lump size, f.o.b. car at Baltimore, Philadelphia, New York, Birmingham, Rockdale, Rockwood, Tenn.

Carload lots (bulk)	$135.00
Ton lots (packed)	141.00
Less ton lots (packed)	148.50

Premium, $1.70 for each 1% above 82% Mn; penalty, $1.70 for each 1% below 78%.

Electrolytic Manganese

99.9% manganese, maximum base contract price per lb. of metal, bulk, f.o.b. shipping point, with freight allowed to destination. Size 1" x D.

	Eastern Zone	Central Zone	Western Zone
Carload lots	37.60c.	37.85c.	38.15c.
l.c.l. lots	39.60c.	38.60c.	40.65c.

Spiegeleisen

Maximum base contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.

	16-19% Mn 1% max. Si	19-21% Mn 1% max. Si	26-28% Mn 1% max. Si
Carloads	$35.00	$36.00	$49.50
Less ton*	47.50	48.50	62.00

Electric Ferrosilicon

OPA maximum base price cents per lb. contained Si, lump size in carlots, f.o.b. shipping point with freight allowed to destination.

	Eastern Zone	Central Zone	Western Zone
50% silicon	6.65c.	7.10c.	7.25c.
75% silicon	8.05c.	8.20c.	8.75c.

Spot sales 45c. per lb. higher for 50% Si; 30c. for 75% Si. For extras and premiums see MPR 405.

Silvery Iron

(*Per Gross Ton, base 6.00 to 6.50 Si*)

F.o.b. Jackson, Ohio	$29.50*
Buffalo	30.75*

For each additional 0.50% silicon add $1 a ton. For each 0.50% manganese over 1% add 50c. a ton. Add $1 a ton for 0.75% phosphorus or over.

*Official OPA price established June 24, 1941.

Bessemer Ferrosilicon

Prices are $1 a ton above silvery iron quotations of comparable analysis.

Silicon Metal

OPA maximum base price per lb. of contained Si, lump size, f.o.b. shipping point with freight allowed to destination, for l.c.l. above 2000 lb., packed.

	Eastern Zone	Central Zone	Western Zone
96% Si, 2% Fe.	13.10c.	13.55c.	16.50c.
97% Si, 1% Fe.	13.45c.	13.90c.	16.80c.

Ferrosilicon Briquets

OPA maximum base price per lb. of briquet, bulk, f.o.b. shipping point with freight allowed to destination. Approximately 40% silicon.

	Eastern Zone	Central Zone	Western Zone
Car lots	3.35c.	3.50c.	3.65c.

Spot prices ¼c. higher per lb. of briquet. For premiums and extras see MPR 405.

Silicomanganese

(*Per gross ton, delivered, carloads, bulk*)

3.00 carbon	$120.00*
2.50 carbon	125.00*
2.00 carbon	130.00*
1.00 carbon	140.00*
Briquets, contract, basis carlots, bulk freight allowed, per lb.	5.80c.†
Packed	6.05c.†
Less ton lots	6.55c.†

*Spot prices are $5 per ton higher.
†Spot prices ¼c. higher.

Ferrochrome

(*65-72% Cr, 2% max. Si*)

OPA maximum base contract prices per lb. of contained Cr, lump size in carlots, f.o.b. shipping point, freight allowed to destination.

	Eastern Zone	Central Zone	Western Zone
0.03% carbon	25.00c.	25.40c.	26.00c.
0.06% carbon	23.00c.	23.40c.	24.00c.
0.10% carbon	22.50c.	22.90c.	23.50c.
1.00% carbon	20.50c.	20.90c.	21.50c.
2.00% carbon	19.50c.	19.90c.	20.50c.

Spot prices are ¼c. higher per lb. contained Cr. For extras and premiums see MPR 407.

PRICES

Other Ferroalloys

Ferrotungsten, Standard grade, lump or ¼X down, packed, f.o.b. producer's plant at Niagara Falls, New York, Washington, Pa., York, Pa., per lb. contained tungsten. 10,000 lb. or more $1.90

Ferrovanadium, 30-35%, contract basis, f.o.b. producer's plant, usual freight allowances, any quantity, per lb. contained vanadium.
- Open Hearth $2.70
- Crucible $2.80
- Primos $2.90

Cobalt, 97% min., keg packed, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. of cobalt metal $1.50

Vanadium pentoxide, 88%-92% V_2O_5 technical grade, contract basis, any quantity, per lb. contained V_2O_5 ..... $1.10

Ferroboron, contract basis, 17.50% boron minimum, f.o.b. Niagara Falls, carlots, per lb. alloy..... $1.20
Ton lots $1.25

Silcaz No. 3, contract basis, f.o.b. Niagara Falls, all quantities, per lb. of alloy ..... 23c.

Silvaz No. 3, contract basis, f.o.b. Niagara Falls, all quantities, per lb. of alloy ..... 40c.

Grainal, f.o.b. Bridgeville, Pa., freight allowed 100 lb. and over, maximum based on rate to St. Louis, per lb..... 45c.

Bortam, f.o.b. Niagara Falls
Ton lots, per lb. ..... 45c.
Less ton lots, per lb..... 50c.

Borosil, 3% to 4% boron, 40 to 45% silicon, f.o.b. Philo, Ohio, per lb. contained boron..... $7.00

Ferrocolumbium, 50% to 60%, f.o.b. Niagara Falls, ton lots, per lb. contained columbium ... $2.25
Less ton lots $2.30

Ferrotitanium, 40%-45%, f.o.b. Niagara Falls, N. Y., ton lots, per lb. contained titanium $1.23
Less ton lots $1.25

Ferrotitanium, 20%-25%, 0.10 C max., ton lots, per lb. contained titanium $1.35
Less ton lots $1.40

High-carbon ferrotitanium, 15%-20%, 6%-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y., freight allowed East of Mississippi River, North of Baltimore and St. Louis, per gross ton....$142.50
3%-5% carbon $157.50

Ferrophosphorus, 18% electric or blast furnace, f.o.b. Anniston, Ala., carlots, with $3 unitage freight equaled with Rockdale, Tenn., per gross ton $58.50

Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., $3 unitage freight equalized with Nashville, per gross ton $75.00

Ferromolybdenum, 55-75 per cent, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained molybdenum ..... 95c.

Calcium molybdate, 40%-45%, contract basis, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained molybdenum.. 80c.

Molybdenum oxide briquettes, 48%-52% Mo, f.o.b. Langeloth, Pa., per lb. contained Mo..... 80c.

Molybdenum oxide, in cans, f.o.b. Langeloth and Washington, Pa., per lb. contained Mo..... 80c.

Zirconium, 35-40%, contract basis, carloads in bulk or package, per lb. of alloy ..... 15c.
Less ton lots ..... 16c.

Zirconium, 12-15%, contract basis, carlots, bulk, per gross ton.....$102.50
Packed $107.50
Less ton lots $112.50

Alsifer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, per lb. ... 7.50c.
Ton lots ... . 8c.

Simanal (approx. 20% Si, 20% Mn, 20% Al), contract basis, f.o.b. Philo, Ohio, with freight not to exceed St. Louis rate allowed, per lb.
Car lots ..... 9.50c.
Ton lots ..... 10.00c.
Less ton lots ..... 10.50c.

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MACHINED BRONZE PARTS

S & H Bronze Bearings can be furnished in any size or quantity to meet your particular requirements.

Our equipment and manufacturing methods enable us to meet the most exacting specifications and design.

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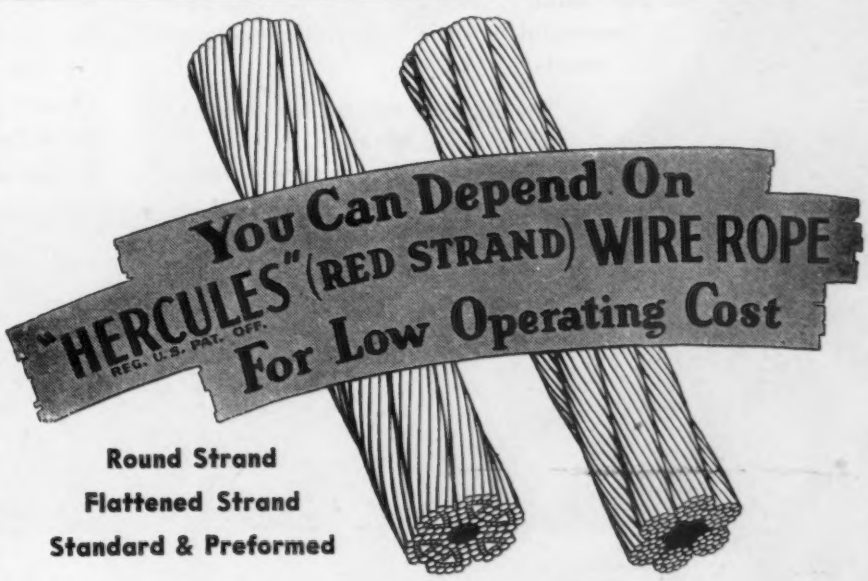

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WHY not let "HERCULES" (Red-Strand) Wire Rope help you meet present day production requirements and still maintain a reasonable margin of profit? You will quickly discover that "HERCULES" is a dependable ally—not only in today's fight against increasing operating costs—but also in your endeavor to speed up production.

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Park #200 Quench Oil

A faster oil for all Quenching Operations

Another step forward in the metal industry is this No. 200 Quench Oil recently developed in the Park Research Laboratories. It is an "accelerated" quench oil that greatly enhances the hardening of steel and is not affected by carry-over from salt baths.

This Park No. 200 Quench Oil is being used by some of the largest manufacturers in the country, and has been proved most successful in their heat treating departments.

Comparison of the hardenability curves obtained in Park No. 200 Oil with those obtained in ordinary quenching oils shows a greater surface and center hardness.

It is true that there is but a few seconds difference in cooling rates between this No. 200 Quench Oil and others but these few seconds make all the difference between partial and complete hardening or the difference between costly rejects or inspection proof work.

For complete technical data about this Park No. 200 Quench Oil or Park's No. 100 and "S" Quench Oils, phone one of our representatives listed below or write us today. No obligation, of course.

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